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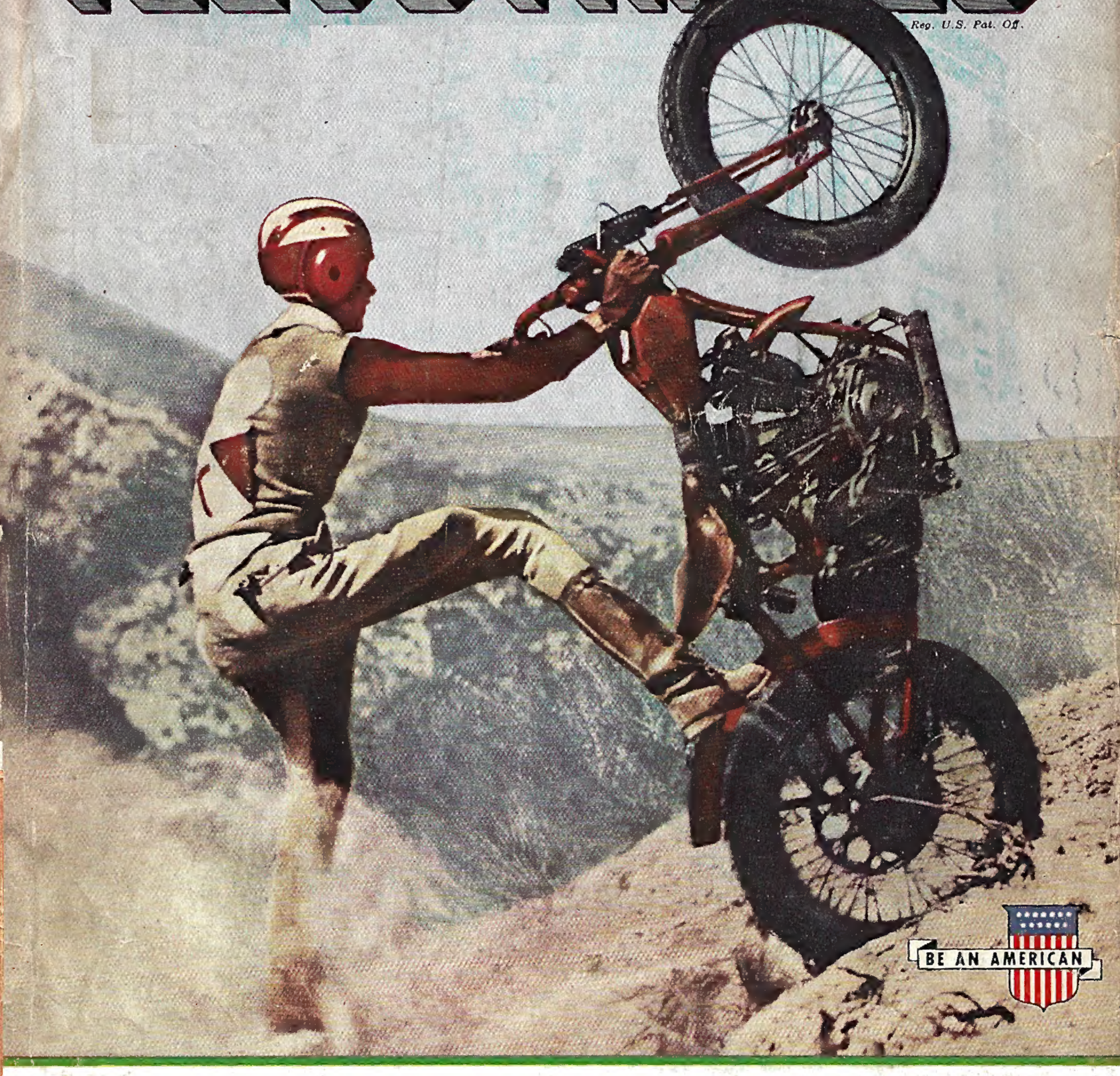

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MARCH
1941

Volume XXV
Number 5

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Last month's issue of MECHANIX ILLUSTRATED had barely hit the newsstands before the letters started to pour in!

Subject: Our "Words-Within-Words" Contest.

The questions covered a lot of territory. Are plurals permissible? Can crosswords have more than eight letters? Can more than one member of a family enter the contest? May I sponsor someone in my family? What does "par" mean—are you supposed to get more, less or the same as "par"? Can Canadians enter the contest?

There were other questions, but these were the ones that seemed to bother the readers most. Since it is absolutely impossible for us to answer the readers' letters individually, let's get those questions straight.

Plurals are permissible, if they can be formed with a letter in the keyboard.

Crosswords cannot have more than eight letters.

As many members of a family may enter as desire—the more the merrier!

You may sponsor someone in your family.

"Par" is an arbitrary, average score. You are supposed to get the highest score possible.

Canadians are eligible to enter the contest.

We advise you to read the rules carefully, study the specimen puzzle, and get to work and win one of those swell prizes!

ROBERT HERTZBERG, Editor

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In U. S. Signal Corps

I am in the U. S. Army, Signal Corps, as Chief Radio Clerk. My duties also include maintenance of the transmitter and receivers when the Chief Radio Operator is absent. —R. W. Anderson, Radio Station WTI, Vancouver Barracks, Washington.

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3. You'll be trained and experienced in a wide-awake, growing field, when you return from Military service, and qualify for better jobs, better pay. Any way you look at it, IT'S SMART TO TRAIN FOR RADIO NOW!

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I Will Train You At Home In Your Spare Time

Don't miss this opportunity. It may never come again. As America's great defense program moves ahead—as thousands of men called in the draft report for service—many new jobs are opening up. But when you look for a GOOD job, you quickly discover this: In one way, TIMES HAVE NOT CHANGED, AND NEVER WILL! Now, as always, the men who get good jobs first—the men who get the best pay—ARE TRAINED MEN!

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How Many Radio Technicians Make $30, $40, $50 A Week

Radio broadcasting stations employ operators, technicians, Radio manufacturers employ testers, inspectors, servicemen in good-pay jobs. Radio jobbers, dealers, employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make $30, $40, $50 a week. Others hold their regular jobs and make $5 to $10 a week fixing Radios in spare time. Automobile, Police, Aviation, Commercial Radio, Loudspeaker Systems, Electronic Devices are other fields offering opportunities for which N. R. I. gives the required knowledge of Radio. Television promises to open good jobs soon.

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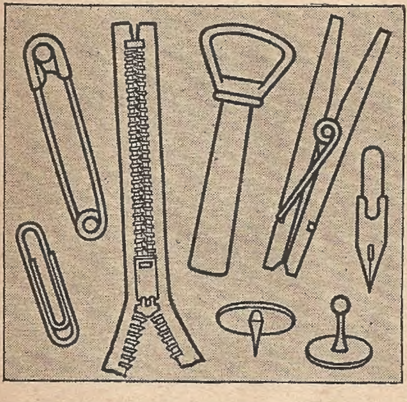

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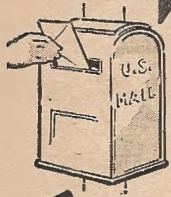

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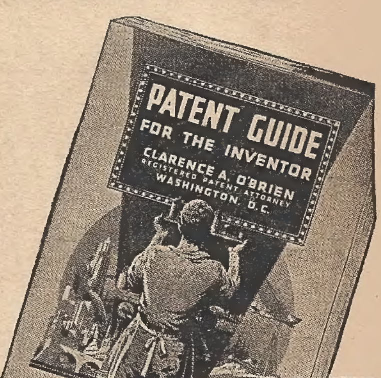

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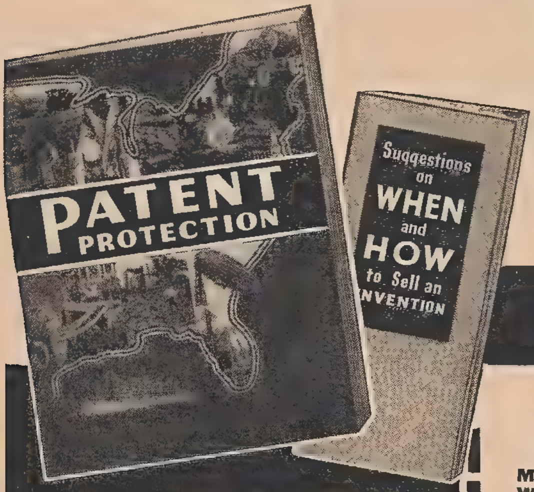
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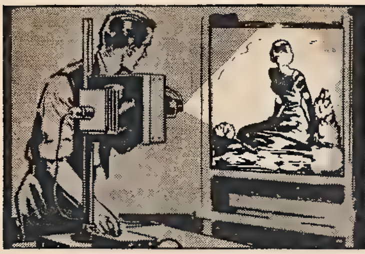


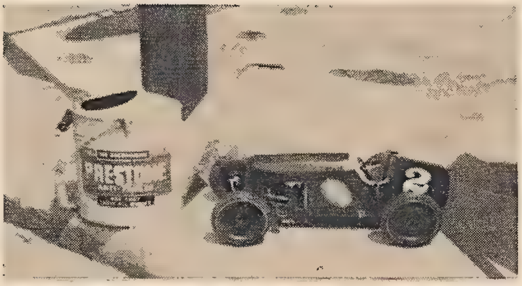
Chips from the EDITOR'S WORKBENCH

WELL, we've learned one thing—when we ask you chaps to write letters, you really write 'em! We mentioned in this space, a month or so ago, that we'd like to hear from you readers, to learn what's on your mind. And, since then, we've been simply swamped with mail, offering every kind of suggestion, from ways to fix up our magazine, to what we could do about it if we didn't like the suggestions.

From it all, though, we've gotten some very helpful hints. One of the things you readers seemed to want the most in MI is more news of your favorite hobby, and, accordingly, we are happy to announce that, beginning in the April issue, the hobby section of the magazine will be considerably expanded. There'll be a definite section set aside for hobbies, and in it will be the latest news of photography, model building and racing, woodcraft, radio, stamps—in short, just about everything you fellows have indicated you would like to see.

We don't plan to devote a complete section to any one of these hobbies in each issue; the hobby department simply will contain, each month, the outstanding events of importance in various fields, and if there isn't any big news in some particular field, we'll just skip that one for the time being and give more space to the more important hobbies of the moment. The main thing is that we want to please you readers, and, in the words of the country grocer, if you don't see what you want, write for it!

Mr. W. Ballingall, of Moose Jaw, Saskatchewan, wins a $5.00 Workbench award with this snapshot of five boats. All of them were built from plans in HOW TO BUILD 20 BOATS, Nos. 4 and 5. The boat at the extreme right is "Scram III," the next three boats are reproductions of "Little Giant," the nearest one having a pointed bow (a modification). The kayak at the extreme left of the picture was made from plans in HOW TO BUILD 20 BOATS No. 4. Blueprints are available for all these boats from Fawcett Publications, Inc., Greenwich, Conn. "Scram III" blueprints cost $1.50 and are listed as blueprint No. 936. "Little Giant" is No. 910, and costs $1.50 also. The kayak blueprint costs only .50, and is listed as No. 915.



The postman who takes walks on his day off can shake hands with Harry Cockley, of Scotland, Pa. Harry is an automobile mechanic, and in his spare time he builds model cars! Here is his version of "Spitfire," which is described in MODEL BUILDER'S HANDBOOK. He put in a special carburetor and says that as a result the midget has been clocked at 50 m.p.h.! Harry wins a Workbench award of $3.00, which should keep "Spitfire" running for quite a while.

* * *

WE HOPE you've already started to work on your word games for the big MI contest! It's never too early to begin, you know, and if you've got your eye on that Taylorcraft plane, or that Indian motorcycle, you'll want all the time you can get to complete your games so as to get the highest possible score. One thing some of you folks seem to be ignoring is the rule against entering into correspondence with us regarding this contest. We feel certain that you will believe and understand us when we say that this contest involves so much extra work for the members of our staff that, to take time out to answer your kind letters—even when you enclose postage—would be a physical impossibility. We just *can't* do it! So don't feel hurt if you've written to us to ask a question regarding the contest and haven't received an answer. You just do anything you want to do that the rules don't prohibit. But *read the rules carefully!* Remember!—an inaccurate entry is worse than no entry at all.

* * *

YOU chaps who are always writing to tell us the latest bright ideas you've picked up while working around your lathe or drill press, are urged to give a thought to the Revere Award, which is announced in this issue by Revere Copper & Brass Inc. To cooperate with agencies furthering national defense, the Revere company has set up

[*Continued on page* 14]

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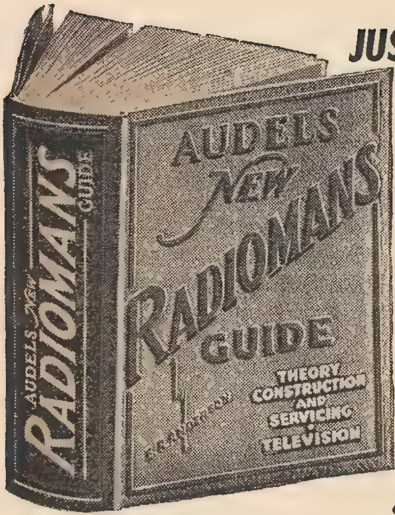
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Editor's Workbench Chips

[*Continued from page* 12]

nine cash prizes, totalling $10,000, which will be given wage earners in the metal and metal-working industries, as well as machine maintenance men, who have ideas or inventions calculated to speed up defense. The deadline is April 30, and if you think you've got some worth-while thoughts on this defense question, we can't urge you too strongly to get in touch with The Revere Award Committee, in Washington, and get one of the entry blanks. After all, you know, $10,000 is $10,000!

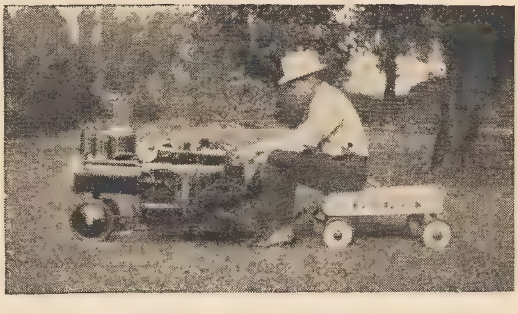
* * *

WE HAD one pretty stern note this past month from a reader up in Canada who thinks we are unpatriotic. The basis of the complainant's case was that we had criticized the British Navy because it had showed a lack of efficiency in allowing a German submarine to slip into Scapa Flow and take a shot at a couple of Men-Of-War.

BECAUSE we know MI readers are a pretty intelligent lot, generally speaking, we don't think it's necessary to tell you here that the new edition of HOW TO BUILD 20 BOATS is now on the stands. But, since we're always getting new readers (applause!), we'd like to remind the newcomers that this gigantic book can be bought at every good newsstand in the country. It has the complete plans for building every kind of boat from a rowboat to a cruiser, and is pretty widely accepted as the most popular boating authority published. So, in case your newsstand hasn't got this amazing book, shoot us fifty cents and we'll see that you get one.

Well, now, in the first place, we weren't a bit unpatriotic. At the time that piece was written, the United States was simply an interested observer of a foreign war, and we were squatting in our editorial chair watching the combat as though it were a naval engagement between parties "A"

[*Continued on page* 19]



Paul Swanson, of Robbinsdale, Minnesota, built this powerful looking little steam engine. He began work on it at 16 years of age and has used his spare time to complete it over a period of years. It weighs about 250 pounds and carries a steam pressure of 50 pounds. On level ground it can haul loads up to 200 pounds, according to its builder. Four feet long overall, it seems well able to pull the wagon and its passenger in the picture. Mr. Swanson wins a $3.00 Workbench award for this snapshot.

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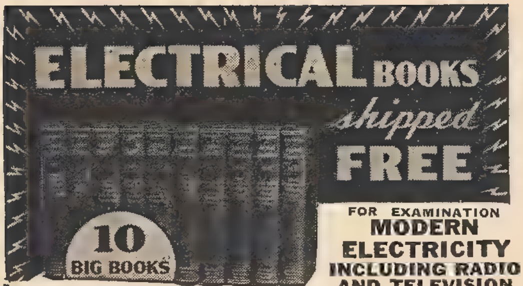

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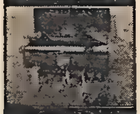

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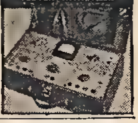

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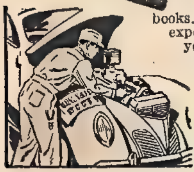

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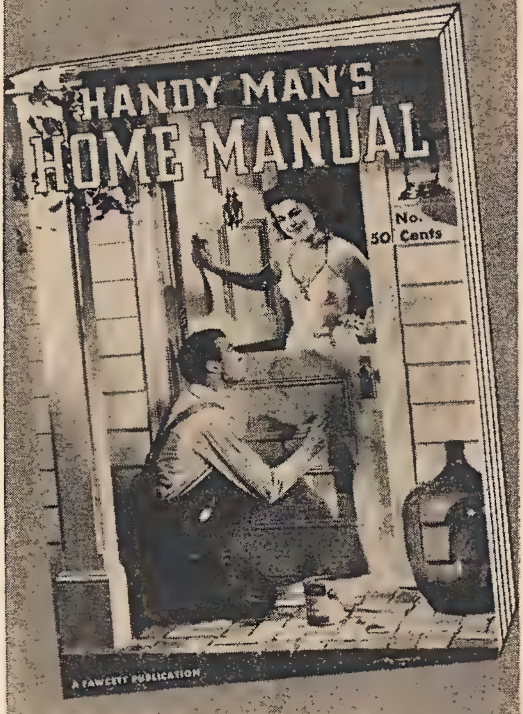

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Editor's Workbench Chips

[*Continued from page* 14]

and "B." It was our contention that, in this particular case, "A," meaning Great Britain, had been lax, and that "B," meaning Germany, had scored a touche. We still think that was the case.

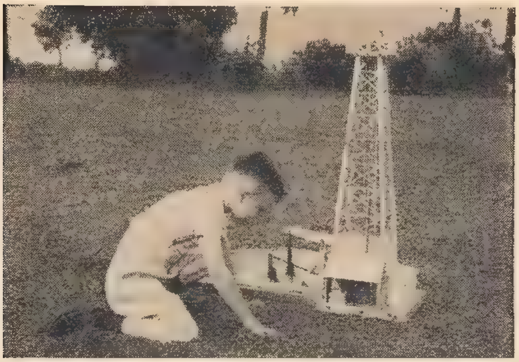
Since then, of course, the United States definitely has taken its official stand on the side of the British and, in the opinion of this department, that's just fine. We are sure that our Canadian friends will believe us when we say that Uncle Sam plans to do everything in his power to help defeat the Nazis, and we are with Great Britain every inch of the way. As a matter of fact, two members of the staff of MI are now in the armed forces, one of them a captain in the United States Army, and the other in Canada, training fliers for the Royal Air Force.

But we must urge our readers to be indulgent with us and remember that, as this is written, the United States still occupies the role of a neutral and is not at war with anybody. And, since this is the case, we still must look upon all military engagements as battles between "A" and "B." And patriotism—for us of the MI editorial staff, at least—still consists of loyalty, first and foremost, to the government of the United States.

* * *

THE "little man who wasn't there" apparently has nothing on the astronomers—they've discovered a little star that wasn't there. A certain Dr. Strand, of Swarthmore College, has announced the discovery of a new star without ever having seen it. It was this way: Dr. Strand photographed the well-known double star, Zeta Aquarii, whose two parts revolve around each other once in every 400 years. But, in looking over his photos, the professor found that the movement of these two

[*Continued on page* 21]



This unusual 1/32 scale model of an oil well represents almost a year of spare time work by Richard Baker, Amity, Pa. He used a variety of materials: balsa wood, pins, small nails, bamboo strips, shoestrings, radio wire, etc. The rig stands thirty-four inches high and about three feet wide and is faithful in all details because the builder once worked in the oil fields and had a chance to familiarize himself with the intricate machinery. He wins a $3.00 Workbench prize for this contribution.

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Editor's Workbench Chips

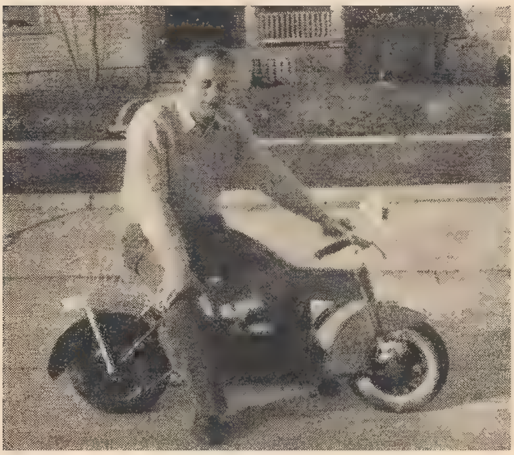
[*Continued from page* 19]

stars was not uniform but was affected by a regular fluctuation from the normal movement over a period of 25 years. He concluded that this fluctuation was due to a third "invisible member" which simply couldn't be caught by the camera but which was there just the same. We haven't checked our own photos lately, but we're going to do it tonight when we get home. And we're going to be particularly interested in the things the pictures don't show—maybe we've got something there.

* * *

THE search for fifth columnists continues apace, and not the least important agent in the ferreting out of these malefactors is the ultraviolet ray. With this invisible light, G-Men and the members of the Dies Committee have uncovered foreign espionage agents by the carload. But now, according to Prof. R. B. Harvey, of the University of Minnesota, the ultraviolet ray is going even farther in its search for saboteurs and is uncovering them in such out of the way places as potatoes. As Prof. Harvey sees it, ultraviolet is about the only means we have of discovering the presence of ring rot, the number one fifth columnist in the potato world. Potatoes, it seems, carry ring rot only through their seeds, but already they've carried the disease through some 37 states in the union, even though you could look at a barrel full of potatoes dying of ring rot and never know the enemy was within the gates.

[*Continued on page* 141]



Joe Chamberlain of Bryn Mawr Apts., Ada, Ohio, built this economical little midget motorcycle. Powered with a ½ horsepower engine that was purchased for only $7.00, the tiny machine carries its rider from 100 to 125 miles on a single gallon of gas! "My wife and I both ride it when going on errands," says Mr. Chamberlain. An old bike frame costing $2.00, and a pair of wheelbarrow wheels for $4.00, comprise the other major parts of the machine. Joe had the local garage do what welding was necessary—the only tool he used himself, was an electric drill! This picture brings him a $3.00 Workbench award.

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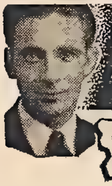

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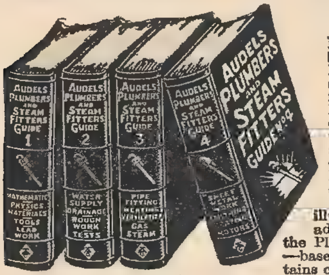
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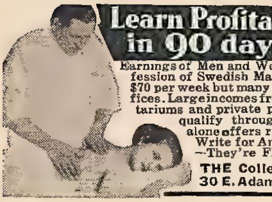

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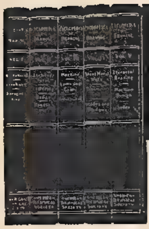

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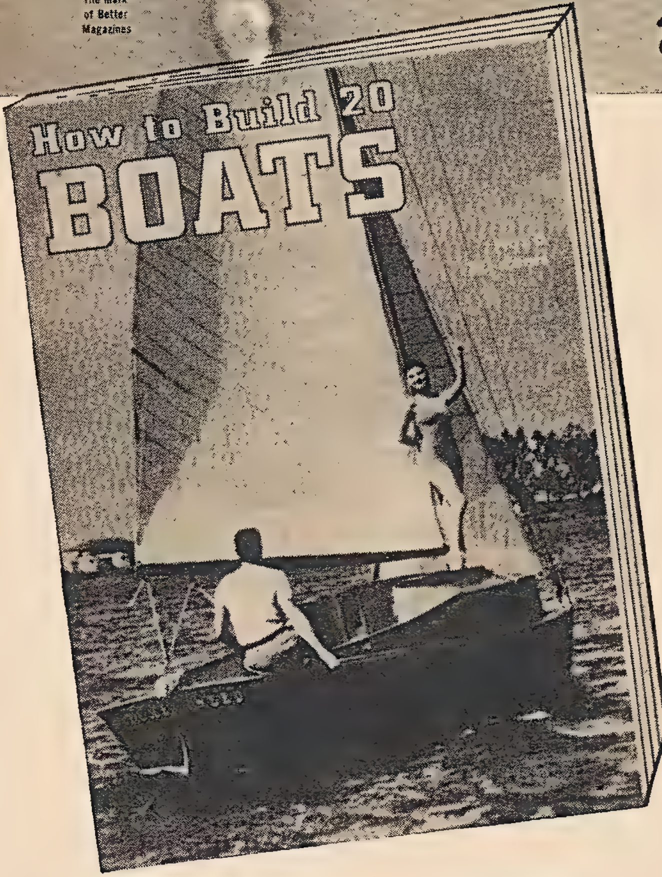

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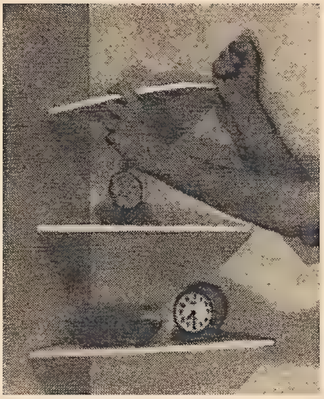

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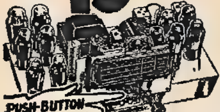

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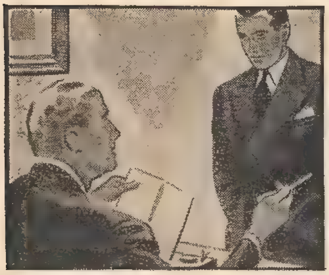
the Case of the Crying Wife

1 Ann doesn't cry easily—but that night I found her in tears! "I can't help it," she sobbed. "All the things we were going to do—buy a car, build a home—remember? And here we are—married three years, and just barely making ends meet! I thought our dreams might come true—but it's no use." I made up my mind right then to "have it out" with the boss.



2 "Look here!" he said. "I can't *pay* you more unless you're *worth* more! And frankly, John, you lack the *training* a bigger job needs. Ever hear of the International Correspondence Schools?"

3 When I learned the boss was a former I.C.S. student, I signed up *quick!* And what a difference it made in my work! I'd never realized until then how *little* I knew about the business.

4 I'm happy, and Ann's happy, and I guess the boss is happy. (At least I've had two "raises" in the last year!) And here's the very same coupon that I mailed, staring *you* in the face!

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☐ Electric Lighting
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☐ Marine Engines
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☐ Practical Telephony
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☐ Radio Operating
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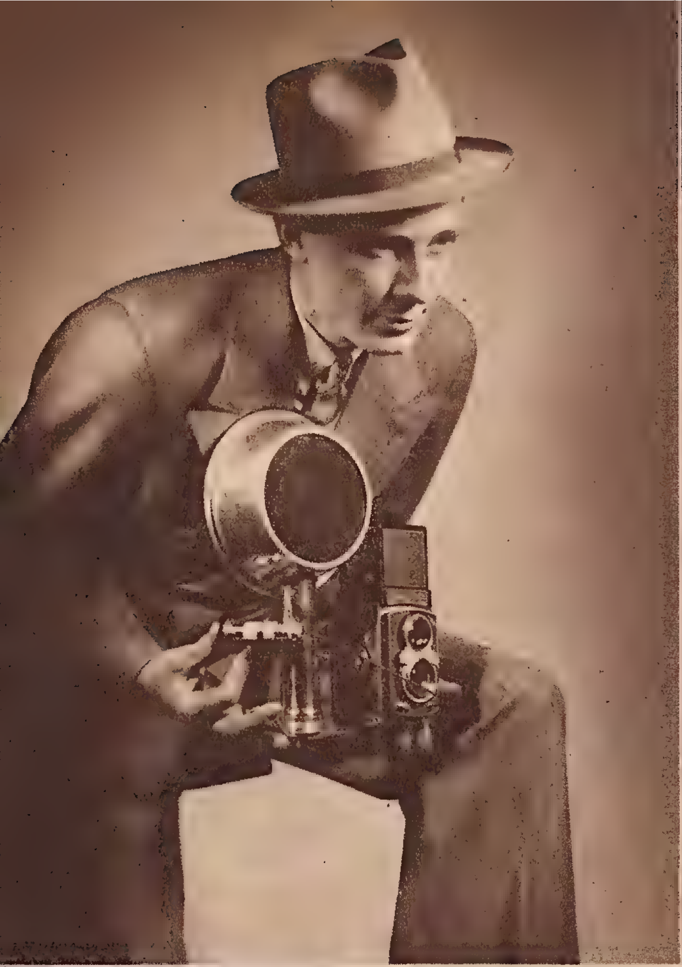
Canadian residents send coupon to International Correspondence Schools Canadian, Limited, Montreal, Canada
British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England



LEFT: Simple flashfilter unit clamped in front of ordinary flash reflector holds back visible rays and passes invisible infra red. BELOW: Taken unawares—exposed in total darkness!

Expose infra red films by filtered flash to make sparkling pictures in total darkness. Use Flashfilter Unit or coated bulbs.

INVISIBLE FLASH for Blackout Photography

by Kenneth Murray

EVER take a flashlight picture with an invisible flash?

It *can* be done!

Not only is this trick possible, it is becoming more and more popular among British photographers who will not be denied their photographic pleasures despite the strict blackout rules in force in England. And, although we don't have blackouts here, Americans can have a grand time playing with and improving upon the invisible flash methods improvised abroad.

Invisible flash photography is based on the recently perfected infra red films that are now available from Eastman, Agfa, and Du Pont, in this country. These films are very sensitive to the invisible infra red component of ordinary light. If the visible rays from a particular standard light source are filtered off in some way and the infra red materials permitted to pass, a camera loaded with infra red film is able to make pictures in total darkness.

The filtering of visible light from a flash bulb may be done either by coating the bulb with a special infra red varnish or by enclosing the flash lamp and reflector behind a light proof infra red screen made of gelatin or solid-dyed glass.

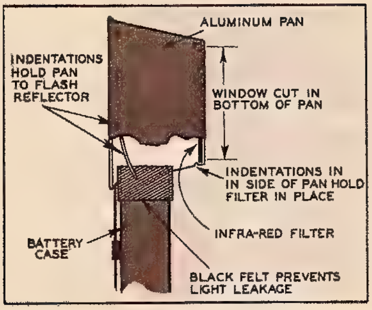
The writer prefers to use a home-built flashfilter unit employing a gelatin filtering screen. It is made in the following way:

Get an aluminum saucepan whose diameter is slightly larger than that of your flashgun reflector. A 25c pan will be more substantial than the 10c variety. Cut a U-shaped opening in one edge of the pan to make it fit snugly around the top of the synchronizer's battery case—after the latter has been covered with a strip of black felt to make the joint light tight. Now, cut out the bottom of the saucepan to make a "window" for the filter, leaving a narrow rim around the edge to serve as a retaining ring.

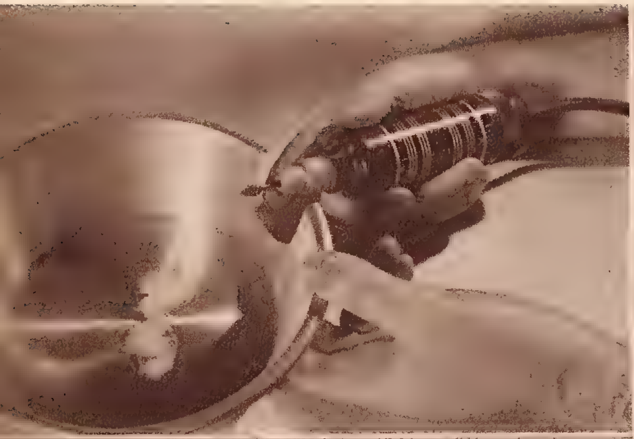
A round or flat metal tool (such as the point of a blunt screwdriver) will serve to indent the sides of the pan at several points from the outside. The indentations hold the filter disc in place against the window opening, and permit the synchronizer reflector to be snapped in place tightly inside the pan. Details are shown in the illustrations.

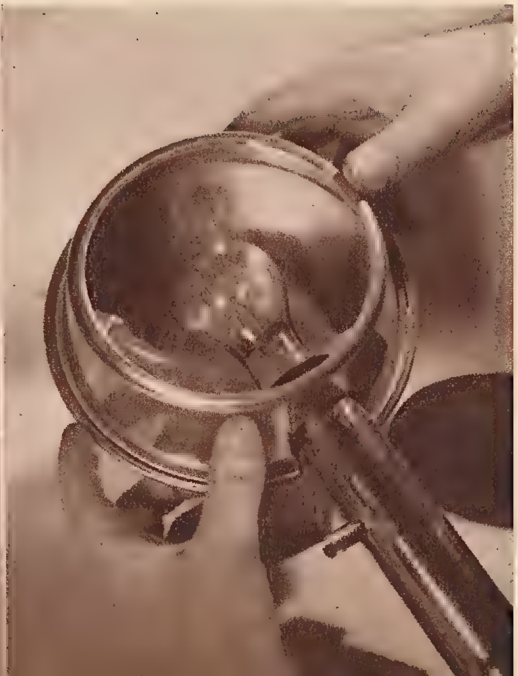
The most satisfactory filter consists of a disc cut from No. 87 Wratten filter gelatin. Sandwich it between two similar discs of glass, sealing the edges with a heavy application of a cellulose household cement (like Du Pont's) to keep out moisture. A filter may also be made by coating a disc of glass with dyed gelatin, the formula of which is given below. Dyed-glass filters, either in squares or cut to order in discs of suitable diameter, may be purchased from the Corning Glass Works,

ABOVE: A high-speed shot by invisible, filtered flash. Subjects and photographer saw no light during the exposure.


ALUMINUM PAN
INDENTATIONS HOLD PAN TO FLASH REFLECTOR
WINDOW CUT IN BOTTOM OF PAN
INDENTATIONS IN IN SIDE OF PAN HOLD FILTER IN PLACE
INFRA-RED FILTER
BATTERY CASE
BLACK FELT PREVENTS LIGHT LEAKAGE

LEFT: Detail of the flashfilter unit, in outline. The writer prefers this device to the use of coated bulbs.





ABOVE: Gap cut into the edge of the pan makes a snug fit around the top of the synchronizer battery case. RIGHT: Fitting the cut-out aluminum pan, minus reflector, in front of the flash reflector to make sure that the flash lamp isn't crowded. Black felt strip at top end of battery case makes a light-tight seal with the fitted reflector-filter unit.

Corning, N. Y. They require considerably more exposure than do the dyed gelatin filters.

Amateur photographers in England have favored the method in which each individual flash bulb is coated with an infra red varnish, the coated bulbs being used in an ordinary reflector. The following formula will be found suitable for coating flash bulbs or the filter glass for a flashfilter unit:

*Eosine, Color Index 768	4 gm.
Tartrazine, C. I. 640	6 gm.
Acid Violet, C. I. 698	4 gm.
Napthaline Green V, C. I. 735	10 gm.
Gelatin (Nelson's Hard)	200 gm.
Glycerine	100 c.c.
Water, to	1000 c.c.

* Dye sources available on request.

Soak the gelatin for an hour in one-half the fluid volume of water, then warm to 100° F. until it dissolves. Each of the dyes must be dissolved separately in a small quantity of water—the Acid Violet being added a little at a time, dissolving each addition before adding more. The water may be warmed, but to not more than 125°F. Dilute each dye solution with a little of the gelatin solution and dilute the glycerine with an equal quantity of warm water. Mix the ingredients prepared as above, one at a time, and add the remainder of the water. Any air bubbles should be removed by filtering through clean muslin.

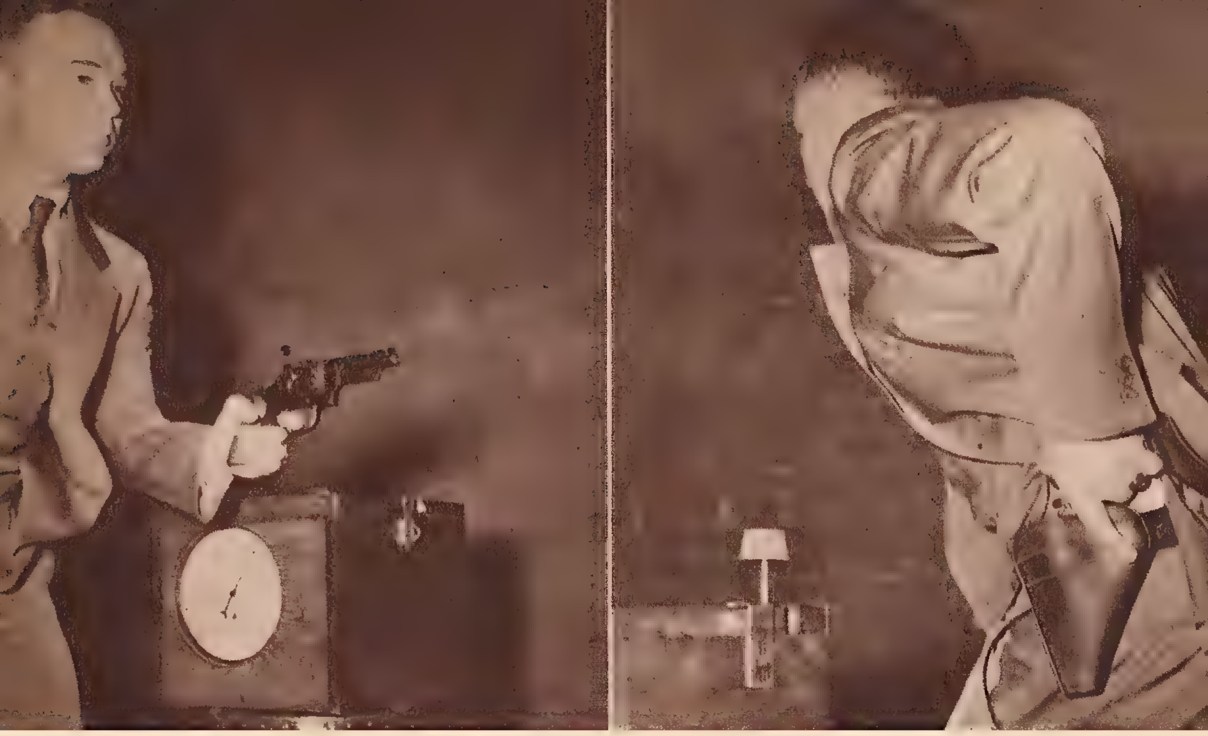
Keep the dyed gelatin solution at 96° F. and immerse the bulbs one at a time. As each bulb is slowly withdrawn, turn it cap downward for a few seconds, then invert it, in order to secure an even coating. Allow the bulbs to dry for at least 24 hours before returning to the original containers for storage.

Alternative method: Dip each flash lamp in infra red gelatin dye solution: then set aside to dry. Flash coated lamps in ordinary flash synchronizers without using flashfilter unit.

Infra red films are available in a wide variety of types, sizes, and lengths. Du Pont Infra-D comes only in the 35mm size for miniature cameras. Agfa infra red film may be had in 35mm and in various popular

[*Continued on page* 139]

ABOVE: Fitting the filter disc into the cut-out bottom of the pan. Slight indentations in the pan hold it in place. RIGHT: The improvised flashfilter unit is held to the standard flash reflector by means of indentations pressed into the side of the aluminum pan. The unit may be snapped loose quickly for changing of flash bulbs between exposures.



G-man Guns Punch ↑ A Time Clock Now

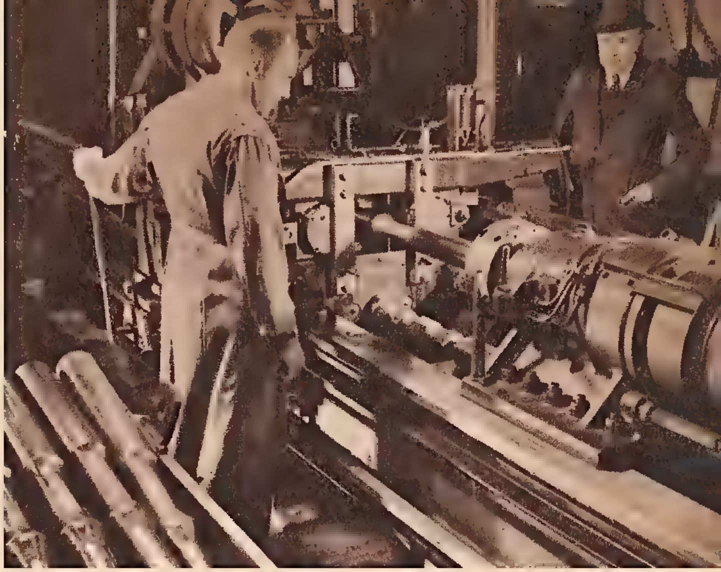
BAD men will have to practice villainy with a stopwatch from now on. The G-men are using this clock mechanism to make themselves "quicker on the draw." As the officer lifts his hand from the clock release, the pointer on the dial ticks off the fractions of seconds until his bullet hits the target. When the bullet strikes, the clock stops.

The Printer— ← Is Off To The Races

THE 35,000-pound vehicle at the left is a complete printing plant. (Interior shown above.) Representing an investment of $65,000, this outfit turns out 10,000 two-color race programs an hour. It follows the horse racing season throughout the country, composing and printing the complete programs at the tracks, in numbers to suit the day's attendance.

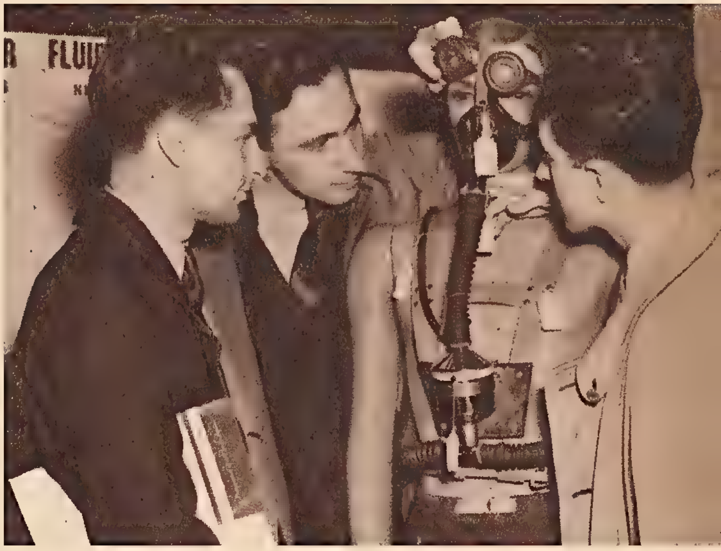
This Machine Will Replace A Lathe

DESIGNED to eliminate one of the bottlenecks of the armament industry, this new machine automatically shapes tubular products to practically any contour that can be machined from solid stock on a lathe. Employed in the aircraft industry to produce landing gear struts, aileron torque tubes and other similar parts, the machine has provision for control of wall thickness, by means of rolls of various tension.



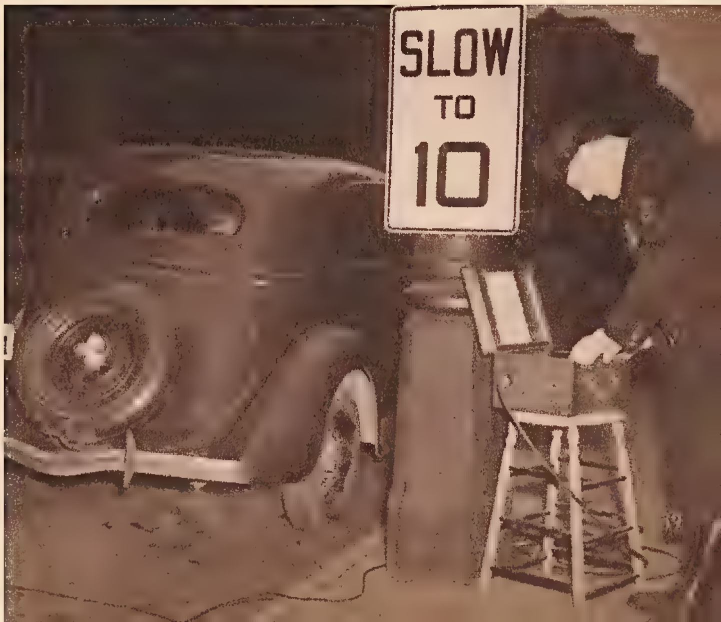
Student Invents A New Diving Mask

A PORTABLE diving apparatus invented for rescue work, which is the invention of Christian J. Lambertsen, 23-year-old sophomore at the University of Pennsylvania medical school, is examined by three of his fellow students. This device makes it possible for a person to stay under water for as much as thirty minutes at a time, and does not use cables or tubes leading to the surface. It was shown at a recent scientific meeting in Philadelphia.

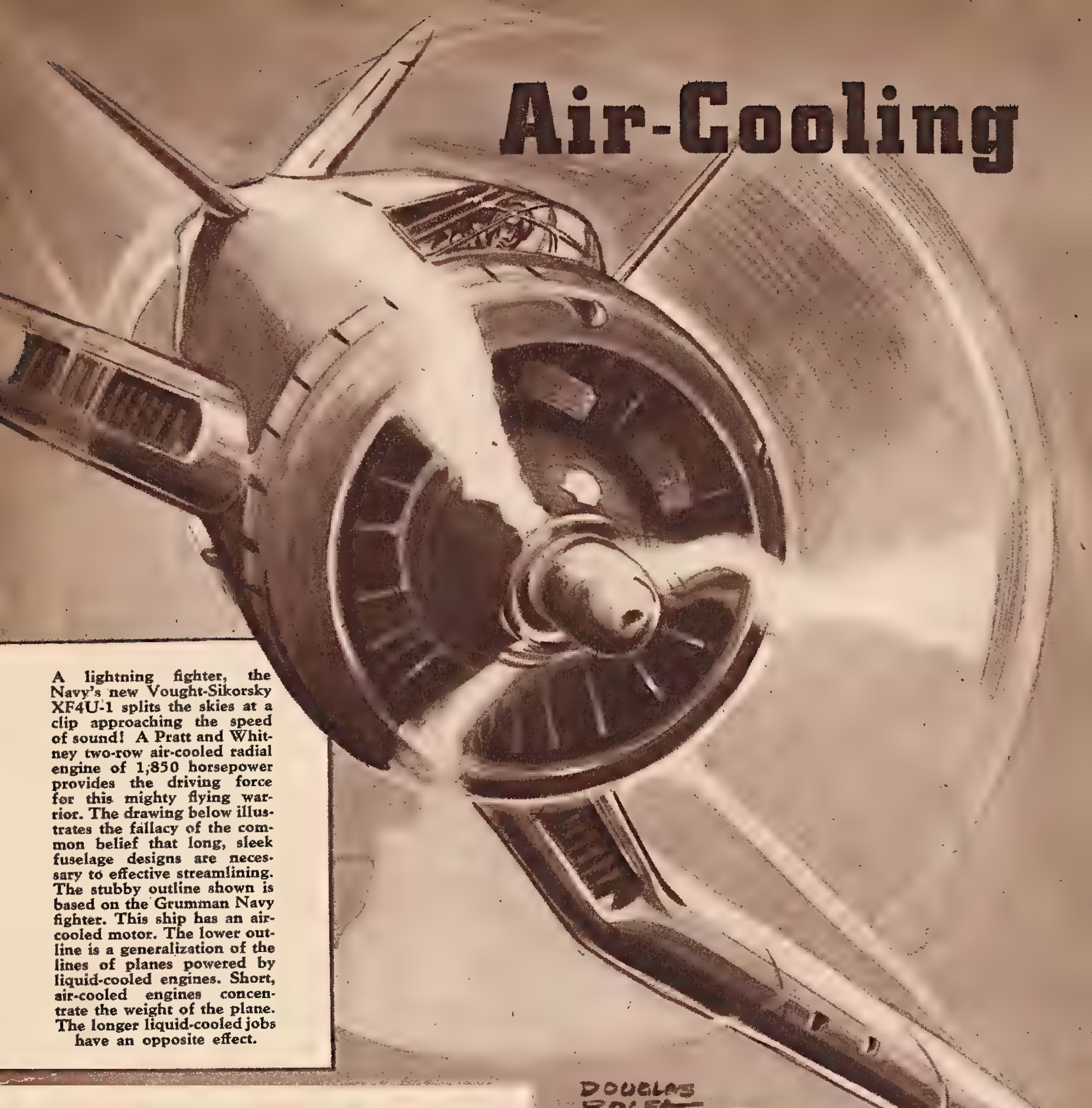


Setting A Trap For 4-Wheeled "Game"

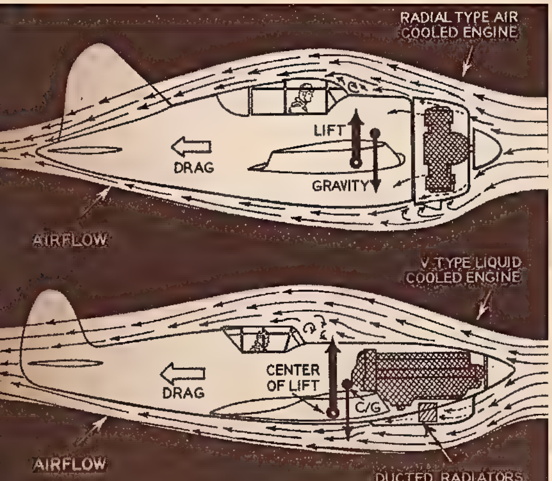
THIS electric speed trap is the newest traffic device to be placed into operation by the Detroit Police Department's traffic engineers. Motorists who disobey speed limits and slow signs can be clocked as the wheels of their cars pass over outstretched wires twelve feet apart. Portable and inexpensive, the apparatus automatically registers the miles-per-hour of any car passing over the wires.



Air-Cooling


DOUGLAS ROLFE

A lightning fighter, the Navy's new Vought-Sikorsky XF4U-1 splits the skies at a clip approaching the speed of sound! A Pratt and Whitney two-row air-cooled radial engine of 1,850 horsepower provides the driving force for this mighty flying warrior. The drawing below illustrates the fallacy of the common belief that long, sleek fuselage designs are necessary to effective streamlining. The stubby outline shown is based on the Grumman Navy fighter. This ship has an air-cooled motor. The lower outline is a generalization of the lines of planes powered by liquid-cooled engines. Short, air-cooled engines concentrate the weight of the plane. The longer liquid-cooled jobs have an opposite effect.


RADIAL TYPE AIR COOLED ENGINE
LIFT
DRAG
GRAVITY
AIRFLOW
V TYPE LIQUID COOLED ENGINE
CENTER OF LIFT
DRAG
C/G
AIRFLOW
DUCTED RADIATORS

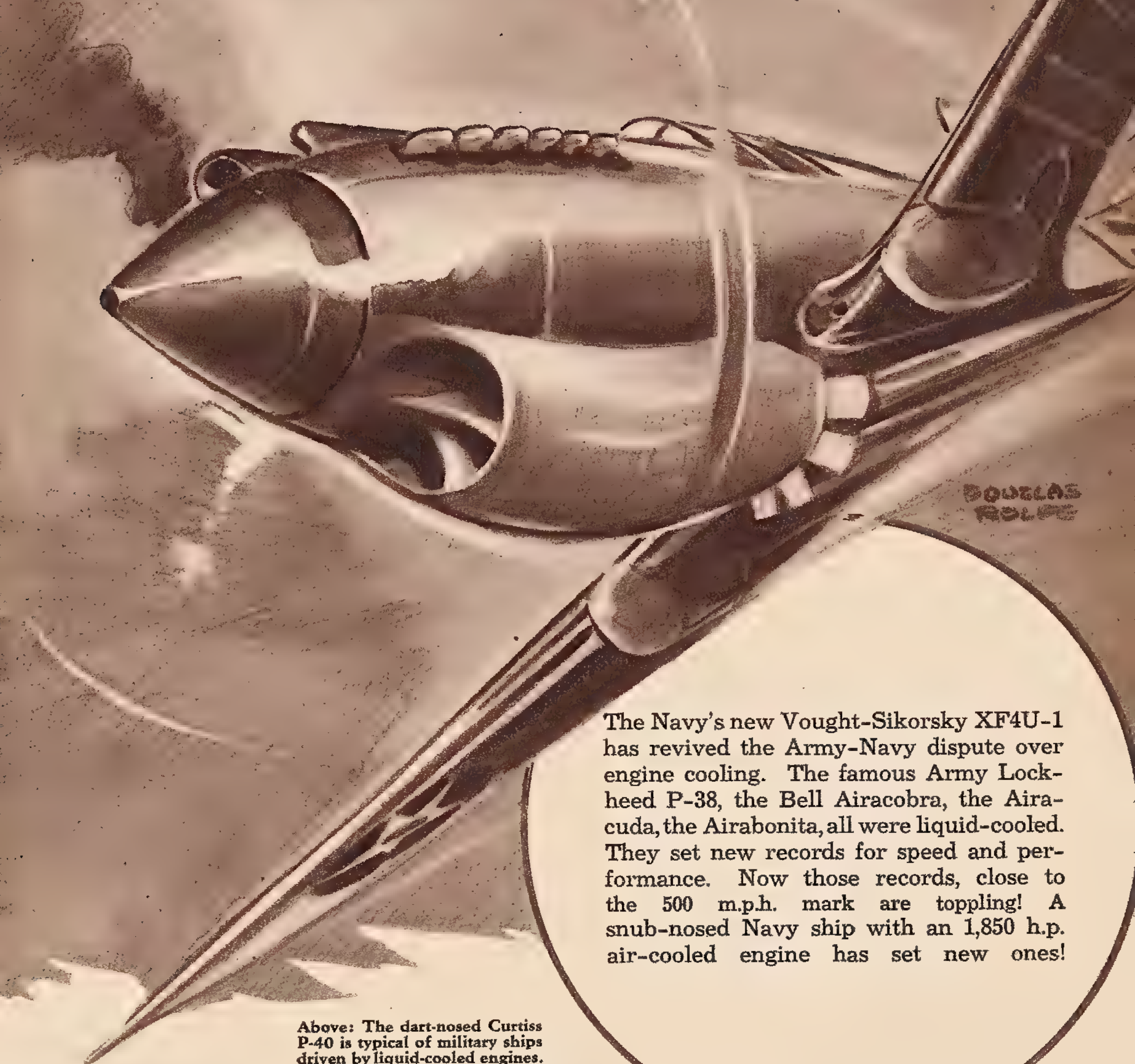
INFLUENCE OF ENGINE DESIGN UPON EXTERNAL FORM

by George Daniels and Douglas Rolfe

NOBODY cared what cooled an airplane motor until Louis Bleriot flew the English Channel in 1909. Louis had spent $100,000 learning to fly, building eleven planes, and having fifty accidents. His trans-Channel monoplane was powered with a 25 h.p. air-cooled Anzani engine. The water-cooled motor that figured in the event belonged to Bleriot's rival, Hubert Latham.

Mr. Latham took off to cross the Channel about a week before Bleriot. He climbed to

vs. Liquid-Cooling!



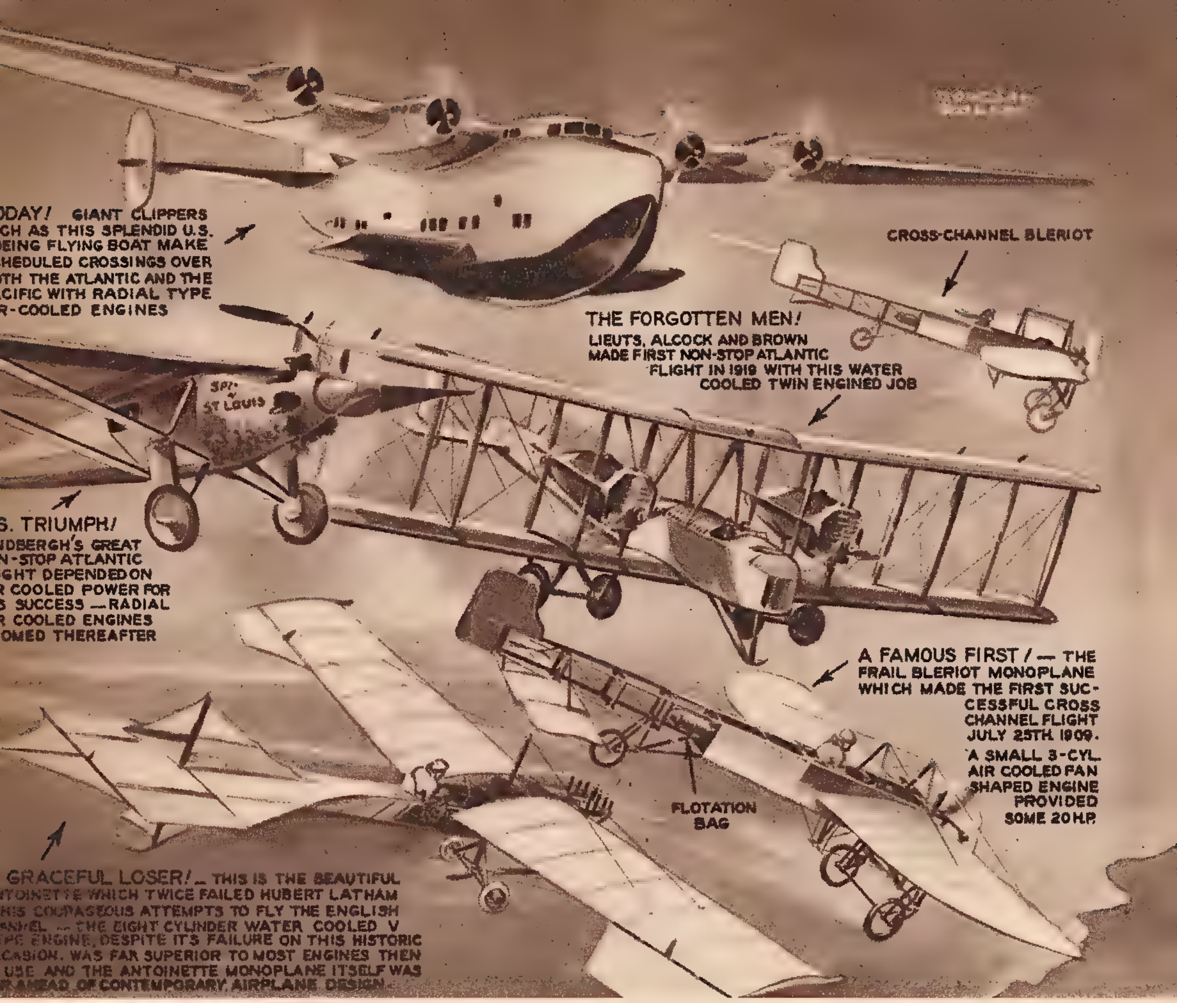
The Navy's new Vought-Sikorsky XF4U-1 has revived the Army-Navy dispute over engine cooling. The famous Army Lockheed P-38, the Bell Airacobra, the Airacuda, the Airabonita, all were liquid-cooled. They set new records for speed and performance. Now those records, close to the 500 m.p.h. mark are toppling! A snub-nosed Navy ship with an 1,850 h.p. air-cooled engine has set new ones!

Above: The dart-nosed Curtiss P-40 is typical of military ships driven by liquid-cooled engines. A 1,090 h.p. Allison engine provides the power to drive it.

900 feet and doubled the official altitude record of the time without batting an eyelash. Then, majestically, he sailed eight miles out over the Channel and fell in—when his water-cooled Antoinette engine quit. Typically British, Mr. Latham sat nonchalantly on the tail of his half-sunk airplane and smoked cigarettes, finally being picked up by a tugboat.

The significant point is that the air-cooled Mr. Bleriot finally made it. After landing behind Dover Castle, he was firmly kissed on both cheeks by some of his countrymen, and taken in town for breakfast. In addition to breakfast, there was the *London Daily Mail* prize of 1,000 pounds. That made air-cooling seem worth while. To cinch it, the water-cooled Mr. Latham made another attempt at the flight and fell in again.

So much for the early history of cooling. The embarrassing thing about any cooling system is the fact that one of its chief purposes is "wasting energy." The average gaso-


DAY! GIANT CLIPPERS
CH AS THIS SPLENDID U.S.
EING FLYING BOAT MAKE
HEDULED CROSSINGS OVER
TH THE ATLANTIC AND THE
CIFIC WITH RADIAL TYPE
R-COOLED ENGINES
CROSS-CHANNEL BLERIOT
THE FORGOTTEN MEN!
LIEUTS. ALCOCK AND BROWN
MADE FIRST NON-STOP ATLANTIC
FLIGHT IN 1919 WITH THIS WATER
COOLED TWIN ENGINED JOB
SPIRIT ST LOUIS
S. TRIUMPH!
DBERGH'S GREAT
N-STOP ATLANTIC
GHT DEPENDED ON
R COOLED POWER FOR
S SUCCESS —RADIAL
R COOLED ENGINES
OMED THEREAFTER
A FAMOUS FIRST! — THE
FRAIL BLERIOT MONOPLANE
WHICH MADE THE FIRST SUCCESSFUL CROSS
CHANNEL FLIGHT
JULY 25TH 1909.
A SMALL 3-CYL.
AIR COOLED FAN
SHAPED ENGINE
PROVIDED
SOME 20 H.P.
FLOTATION
BAG
GRACEFUL LOSER! — THIS IS THE BEAUTIFUL
NTOINETTE WHICH TWICE FAILED HUBERT LATHAM
HIS COURAGEOUS ATTEMPTS TO FLY THE ENGLISH
ANNEL — THE EIGHT CYLINDER WATER COOLED V
PE ENGINE, DESPITE ITS FAILURE ON THIS HISTORIC
CASION, WAS FAR SUPERIOR TO MOST ENGINES THEN
USE AND THE ANTOINETTE MONOPLANE ITSELF WAS
R AHEAD OF CONTEMPORARY AIRPLANE DESIGN.

Above: These planes of the past and present seem to indicate that both air and liquid-cooling can bring fame. Latham's water-cooled ship set a duration record—1 hour, 9 minutes.

Above: The Prestone-cooled Allison engine delivers 1090 h.p. to Curtis P-40 fighters. Left: 1,000 h.P. air-cooled Wright Cyclone.

line engine is seldom more than 25% efficient. Much of the wanted energy is used to heat the air that passes through the radiator or around the cooling fins. Engine cooling, therefore, is really a matter of finding the best way to waste the energy that engineers don't know how to use.

Just imagine what your electric bill would be if you plugged in an array of electric heaters and tried to keep 1,000 pounds of steel hot all day long—while a giant airplane propeller drove a constant icy blast to combat your efforts! The bill you would receive would give you a clear idea of the energy lost through the cooling system of an airplane engine. Every unit of 746 watts used would

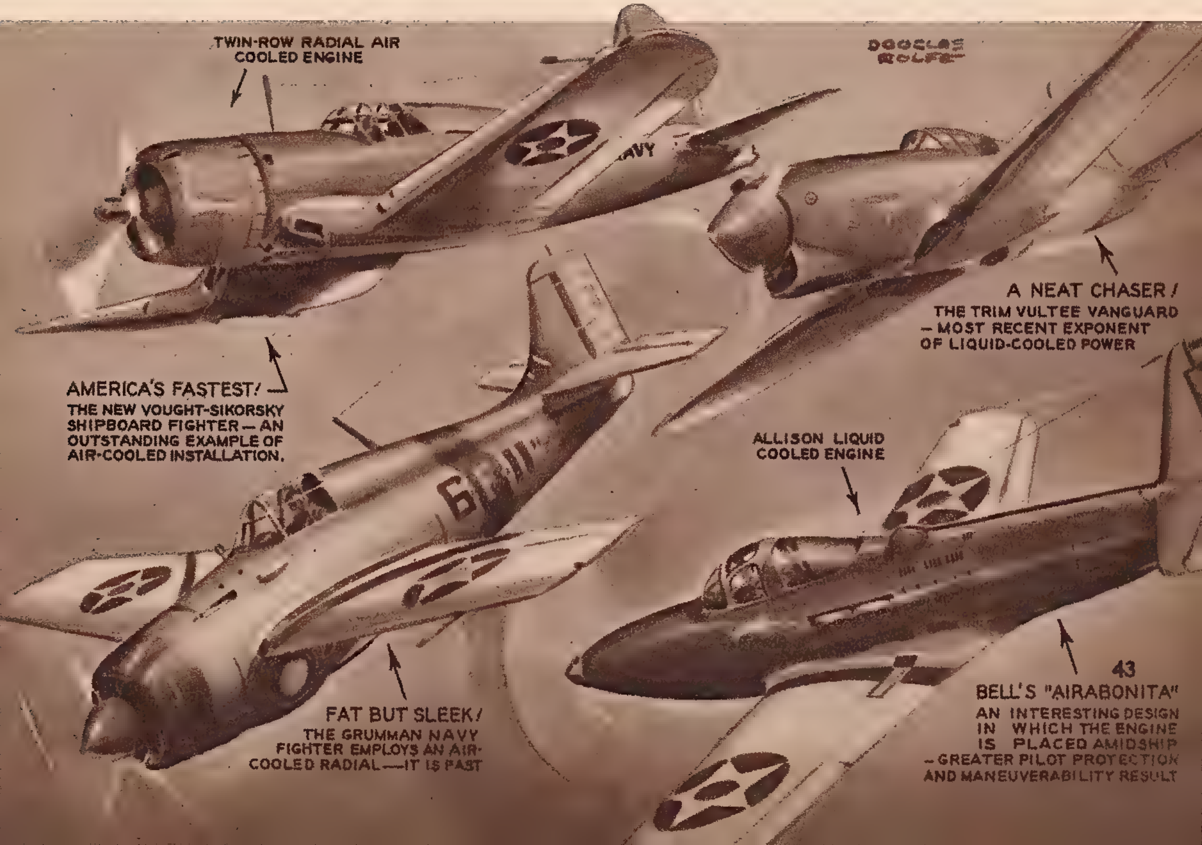
Above: Vought-Sikorsky XF4U-1. It staged a cooling upset.

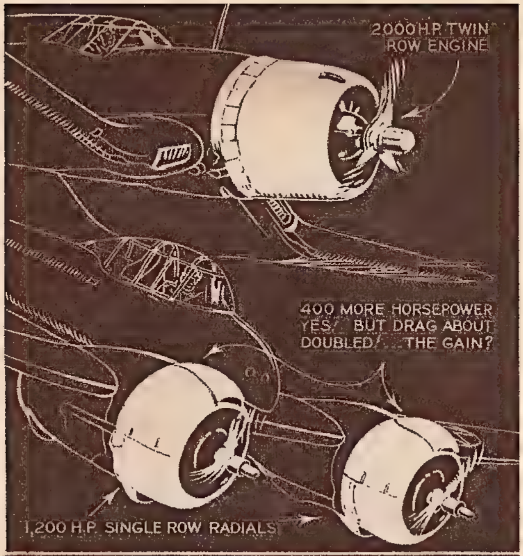
represent one horsepower lost. No method is known at present, however, to utilize the excess heat that must be dissipated through the cooling system. Only a relatively small amount of heat is actually needed to maintain the proper temperature in the manifold for vaporization.

Another fact about liquid-cooling that is seldom mentioned is the improved effectiveness of modern coolants. Certain cooling liquids commonly regarded merely as "anti-freeze," are really more effective coolants than water. Their ability to rid the engine of excess heat with greater efficiency than water, permits the use of smaller radiators. This, of course, reduces the drag of an aircraft in flight. An example of this is to be found in the Prestone-cooled Allison engine used in the Curtiss P-40. Two tiny cylindrical radiators cool the 1,090 h.p. engine.

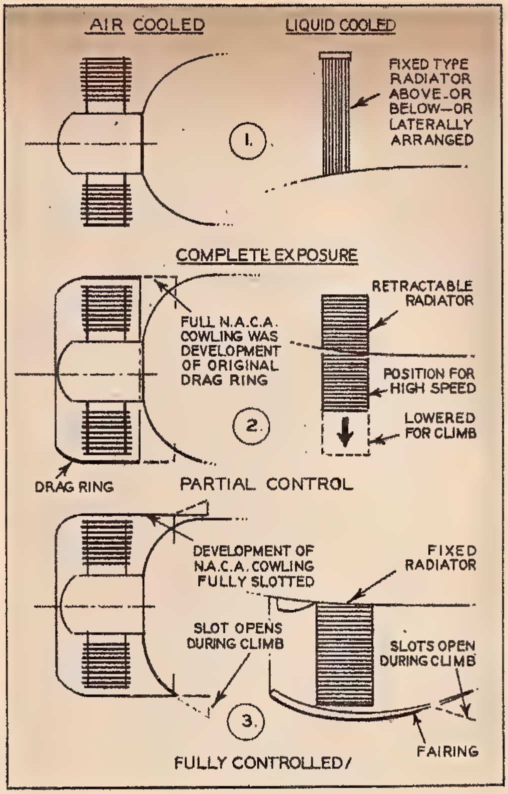
With the super-coolants of today and the resultant reduction in radiator size, fluid-cooling boasts of a definite advantage for military aviation use. The sleek fuselages possible with slender, fluid-cooled motors, afford excellent visibility to the pilot. The only way this can be approached with air-cooled engines is found in the inverted "V" engine, in the inverted tandem, or special fuselage designs. This fact no doubt accounts

Below: Cooling systems in modern American war planes.


TWIN-ROW RADIAL AIR COOLED ENGINE
DOUGLAS ROLFE
NAVY
A NEAT CHASER!
THE TRIM VULTEE VANGUARD – MOST RECENT EXPONENT OF LIQUID-COOLED POWER
AMERICA'S FASTEST!
THE NEW VOUGHT-SIKORSKY SHIPBOARD FIGHTER – AN OUTSTANDING EXAMPLE OF AIR-COOLED INSTALLATION.
ALLISON LIQUID COOLED ENGINE
6-F-11
FAT BUT SLEEK!
THE GRUMMAN NAVY FIGHTER EMPLOYS AN AIR-COOLED RADIAL—IT IS FAST
BELL'S "AIRABONITA"
AN INTERESTING DESIGN IN WHICH THE ENGINE IS PLACED AMIDSHIP – GREATER PILOT PROTECTION AND MANEUVERABILITY RESULT


2000 H.P. TWIN ROW ENGINE
400 MORE HORSEPOWER YES! BUT DRAG ABOUT DOUBLED! ...THE GAIN?
1,200 H.P. SINGLE ROW RADIALS

HOW DOUBLE-ROW AIR COOLED RADIALS SCORE IN EFFICIENCY IS CLEARLY SHOWN HERE — COMBINED FRONTAL AREAS AND RESULTANT DRAG OF TYPICAL TWO-MOTORED INSTALLATION ARE RELATIVELY FAR GREATER THAN SINGLE ENGINE OF COMPARABLE POWER (DRAWINGS IN SAME APPROX. SCALE FOR EASY COMPARISON)


AIR COOLED
LIQUID COOLED
FIXED TYPE RADIATOR ABOVE—OR BELOW—OR LATERALLY ARRANGED
1.
COMPLETE EXPOSURE
RETRACTABLE RADIATOR
FULL N.A.C.A. COWLING WAS DEVELOPMENT OF ORIGINAL DRAG RING
POSITION FOR HIGH SPEED
LOWERED FOR CLIMB
2.
DRAG RING
PARTIAL CONTROL
DEVELOPMENT OF N.A.C.A. COWLING FULLY SLOTTED
FIXED RADIATOR
SLOT OPENS DURING CLIMB
SLOTS OPEN DURING CLIMB
3.
FAIRING
FULLY CONTROLLED!

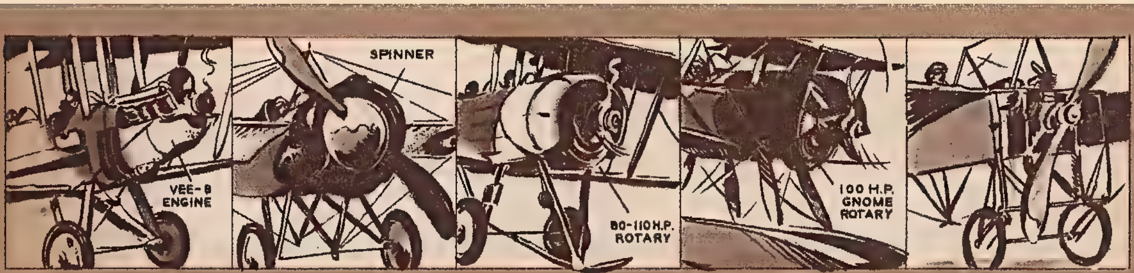
Above: The new XF4U-1 crams nearly 2,000 h.p. in its two-row air-cooled radial. The Grumman Skyrocket uses two single-row engines. Right: Process in adjustable cooling arrangements.

for the popularity of the fluid-cooled engines in current war use.

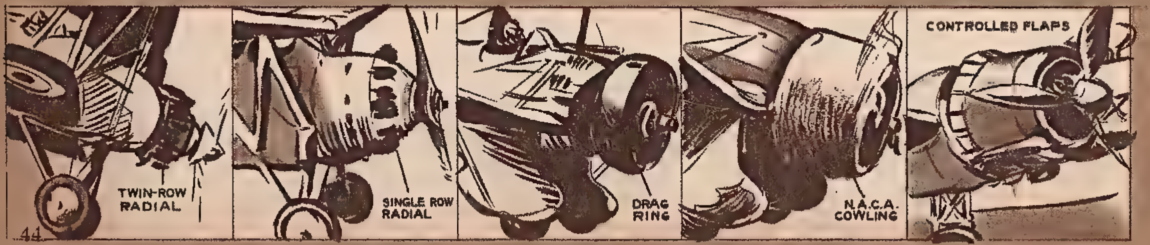
The cooling dispute reached a fever pitch in the last war. German engineers showed a decided preference for water-cooling. A factor that may have influenced them at that time was the difficulty of mass production of air-cooled cylinders. The fins made casting difficult. One well-known motor of that day sported cylinders that had to be machined on a lathe from 90-pound solid steel bars! Improved foundry techniques have made production much simpler since then. The German designers had considerable success with water-cooling. Their motors of 1914 showed great reliability at a time when that quality was none too common in aircraft engines. The clumsy appearance of such famous fighting planes as the Fokker DVII and the Albatross, however, resulted from the requirements of the then bulky water-cooled motors.

The Allies developed both types of cooling.

Below: Development of streamlined air-cooling of power plants.

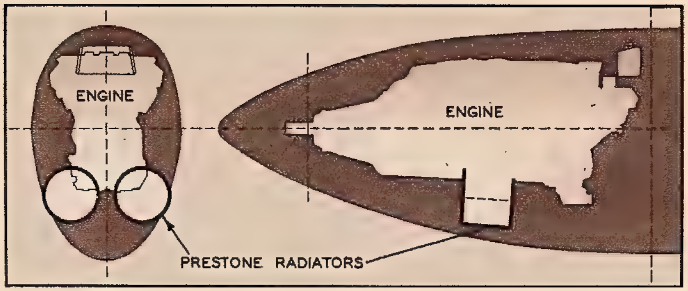

VEE-8 ENGINE
SPINNER
80-110 H.P. ROTARY
100 H.P. GNOME ROTARY

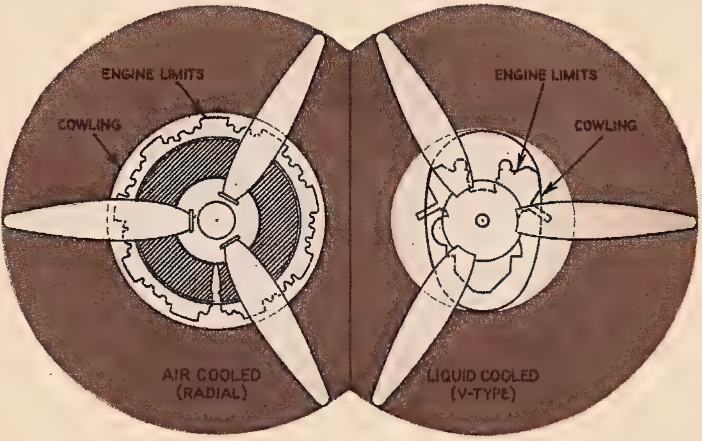
1916 ALSO PRODUCED THIS — 1916 AN IMPROVED ENTRY — 1915-16 TYPICAL COWLING — 1914 SCHNEIDER CUP WINNER — 1909 CROSS-CHANNEL IDEA!


TWIN-ROW RADIAL
SINGLE ROW RADIAL
DRAG RING
N.A.C.A. COWLING
CONTROLLED FLAPS

1923 OUT IN THE COLD! — 1923 NEATER AND NICER — TOWARDS THE GOAL! — FURTHER DEVELOPMENT — TODAY-EFFICIENT COOLING

IMPORTANT STAGES IN THE DEVELOPMENT OF AIR COOLED POWER FOR AIRPLANES


ENGINE
ENGINE
PRESTONE RADIATORS


ENGINE LIMITS
COWLING
AIR COOLED (RADIAL)
ENGINE LIMITS
COWLING
LIQUID COOLED (V-TYPE)

Above: The use of modern coolants makes small radiators possible. Drawing based on P-40 cooling system. Below: The small frontal area of liquid-cooled engine obstructs less propeller disc area than air-cooled job.

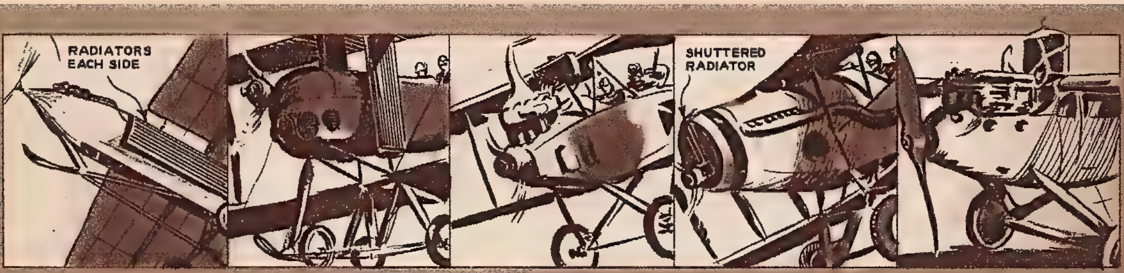
The famous Gnome rotary engine, with its whirling cylinders and stationary crankshaft, was one of the most outstanding air-cooled motors of the war. In common with other air-cooled powerplants, it was very light for its horsepower. Its "flat" design aided in concentrating the weight of the plane, a feature that greatly enhanced maneuverability. The Canton and Unne (Salmson) motor, an unusual water-cooled radial, shared this quality, although heavier. The latter motor established an excellent record for reliability despite the rather complicated problem of water cooling a radial engine. Moreover, it was often mounted horizontally, and geared to the propellar. (See sketch below.)

After the war, most American civilian planes were powered with mass-produced water-cooled war plane engines. Among the most famous of these were the Curtiss OX-5 and the world famed Liberty. The former motor was the mainstay of the "barnstormers." The Liberty helped to make history in 1919 by driving the Navy's NC flying boats on their transatlantic flight. Although three of these boats took part in the flight, only one, the NC-4, actually completed the trip. That fact may be partly responsible for the Navy's aversion to water cooling.

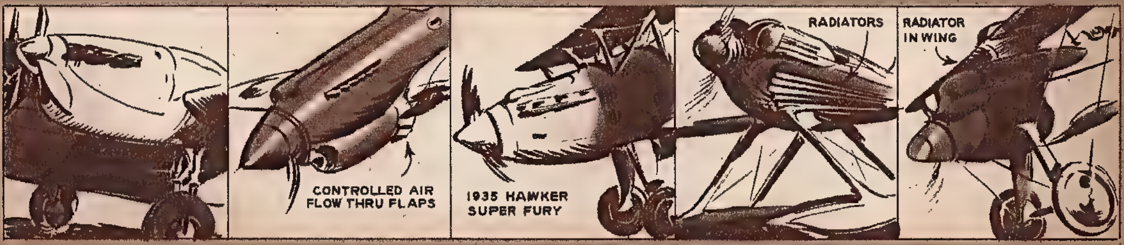
On June 14, 1919, water-cooled engines scored a real triumph. Two black cats and their English pilots, Alcock and Brown, sauntered across a field of thick Irish mud after having made the first non-stop airplane

[*Continued on page* 140]

Below: How modern liquid-cooling evolved from early types.


RADIATORS EACH SIDE
SHUTTERED RADIATOR

1909 - A WELL-BRED LOSER 1911 - SOUND ENGINEERING 1914 - THE GERMAN IDEA 1917 — A FITTER FIGHTER 1921 — PERIOD PLUMBING


CONTROLLED AIR FLOW THRU FLAPS
1935 HAWKER SUPER FURY
RADIATORS
RADIATOR IN WING

1941 - A WET WELLINGTON TODAY! A CLEAN NOSE BEFORE THE HURRICANE SCHNEIDER CUP WINNER 1923 - THE AWAKENING

IMPORTANT STAGES IN THE EVOLUTION OF LIQUID COOLED AIRPLANE ENGINES

Wings Over The Water!

Seaplaning, which used to be exclusively a "rich man's sport," has, with the advent of good, light planes, become something which people of moderate means may enjoy.

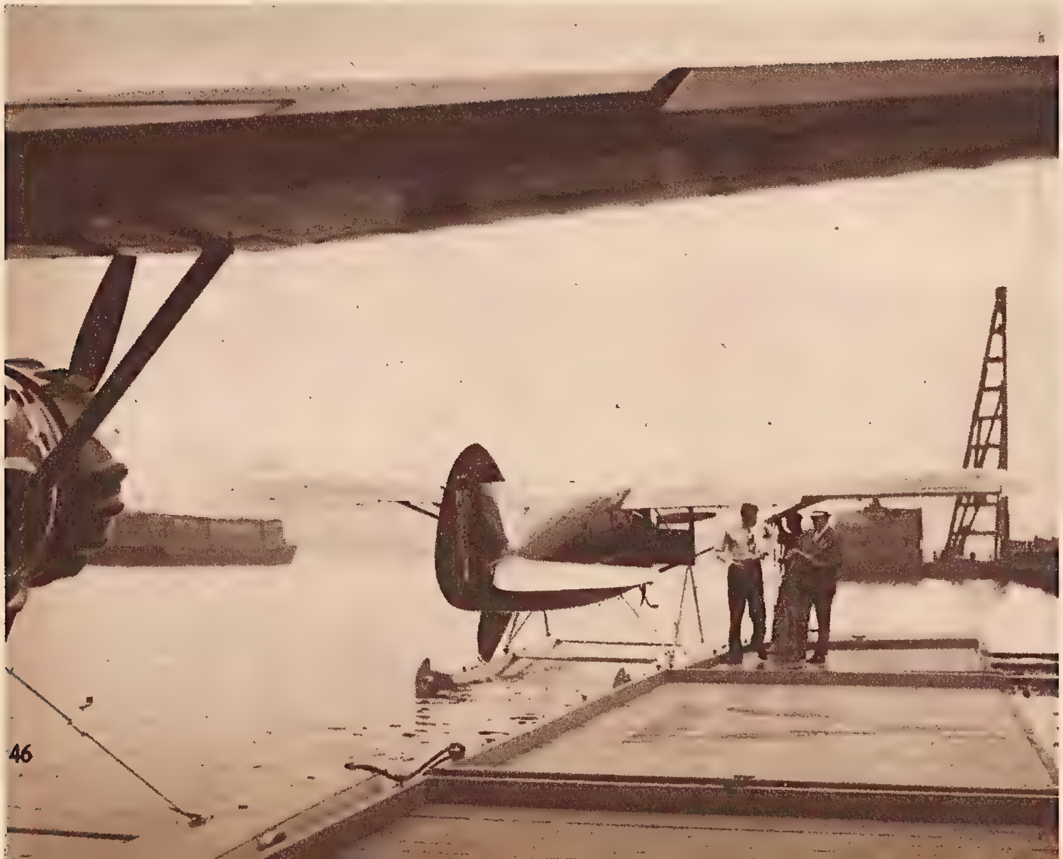
A THUNDER head was piling itself up against the sunset, but the Aeronca cabin job quickly left it behind and sped south over the coastline—only to be challenged to another race by a creeping white wall of fog as it plunged toward Lake Winnepesaukee at 100 miles an hour.

"Think we'll make it, Bud?" asked one of the occupants of the plane, anxiously.

"Sure, with plenty to spare," answered the pilot. "We'll be at Jack's in about ten minutes."

Ten minutes on the nose and the Aeronca came to rest on Lake Winnepesaukee and slowly made its way toward Jack McManus' seaplane base, where the men waited for more favorable weather before resuming their flight to Boston.

Below, is an NYA-built float at the Downtown Skyport, in New York City. The decks of the floats are painted the standard international orange color and carry the usual black triangle for identification. Floats such as this form a network of seaplane landings that dot the coasts and inland waterways of the country.



Hunters, like those shown at the left, have discovered that seaplanes are wonderful for getting them to the hunting territories and bringing them home.

Seaplanes are a great help to fishermen, too! The man below is enjoying his fishing from a seat on one of the pontoons of the plane. If the fish don't bite, he can up and fly to a new spot!

These two men were heading home from a week end hunting trip in the woods of Maine. The trip alone, by any other mode of travel, would have consumed most of the week end. Instead, the two men chartered a seaplane at the Wiggins Airways in Boston, flew to Lake Winnepesaukee, breakfasted and continued to Naples, Maine, put in two solid days of hunting, and returned by the same route in time to report to work on Monday morning.

Seaplane operation is striking a responsive chord with the American public, which seems ready and willing to dish out hard cash for the fun of flying on water. The business is equally divided between pilots taking instructions or renting the plane for local flights, and the general public buying $1 joy hops or the $5 scenic rides.

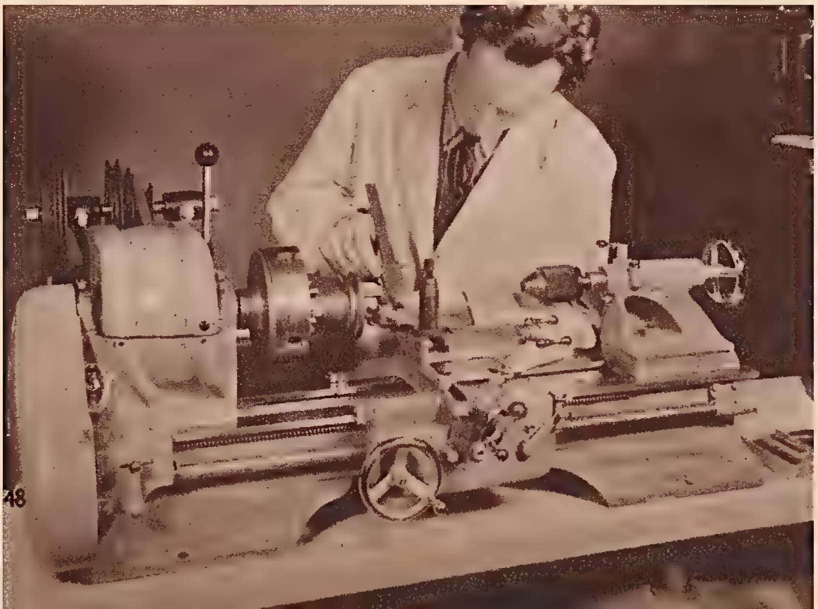
Through the joint CAA-NYA low-cost seaplane base program some 300 floats have mushroomed throughout the country and there will soon be more. The fixed base operators bless the day they left a hot dusty

[*Continued on page* 136]

YOU CAN WIN THESE

FIRST PRIZE
$1,500 Taylorcraft Airplane

A Taylorcraft plane, an Indian motorcycle, a lathe, and 100 other valuable prizes, to be given away absolutely FREE in the MECHANIX ILLUSTRATED contest!



THIRD PRIZE

Atlas Lathe and Accessories

GREAT PRIZES!

COME on, boys—it's still not too late! You still have a chance to enter the great MECHANIX ILLUSTRATED contest!

Get in this thrilling contest *today*—and you may win the $1,500 Taylorcraft Trainer pictured on the opposite page, an Indian Junior Scout 1941 motorcycle, an Atlas lathe and accessories valued at $225, or any one of a hundred other amazing prizes valued at thousands of dollars. They're all FREE!

Just look at that plane! Ever see anything like her? A perfect dream of a flying ship, that's what she is! And that motorcycle—why a fellow would give the shirt off his back to own a machine like that! Then look at the rest of these great prizes—that lathe, the Deagan marimba, the boats, radios, camera supplies, and shop equipment.

It's the most astounding collection of prizes ever offered to the readers of a magazine!

BUT here's the swell part of it—you can win one of these great prizes *just by playing a game!*

There are no essays to write in this contest, no box-tops to send in, no statements to fill out and no subscriptions to sell! All you have to do is play MECHANIX ILLUSTRATED's fascinating new word game, "Words-Within-Words."

You'll find this month's "Words-Within-Words" game on pages 56 and 57. You don't have to send it in now—just start working on it, and wait for next month's puzzle.

But start working on them *now!* And then get ready for the big closing puzzle in the April MECHANIX ILLUSTRATED!

SECOND PRIZE **1941 Indian Junior Scout Motorcycle**

FOURTH PRIZE
$235 Deagan Marimba

FIFTH PRIZE
Midwest Radio, valued at $109.75

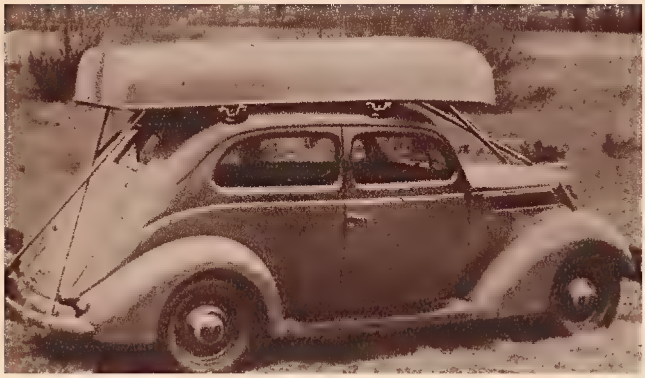
Contest Prizes!

6th PRIZE

$100 Gruen Curvex Wrist Watch.

7th PRIZE

Choice: Fisher MT Scope or Fisher Junior Radio Pilot.



8th PRIZE Penn Yan Cartop Boat, value $89.

9th PRIZE

$75 Briggs & Stratton Inboard Engine.

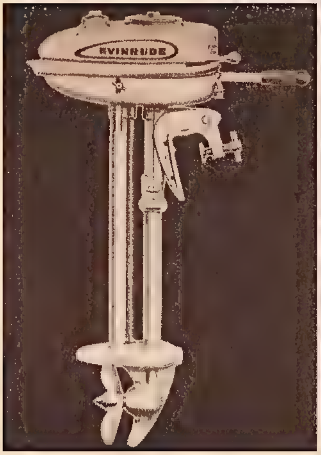
10th PRIZE $70 Mead Glider Ki-Yak.

11th PRIZE 12-Tube Knight Radio, value $55.

12th PRIZE

$50 Zelphyrplane Jr. Belt Sander.

13th PRIZE Hallicrafters Marine Radio, value $49.50.



14th PRIZE

Evinrude Ranger Outboard Motor, value $47.50.

15th PRIZE Mercury Bicycle, value $47.24.

16th PRIZE

Columbia Bicycle, value $42.15.

17th PRIZE

Marlin Model 90 Shotgun.

18th PRIZE

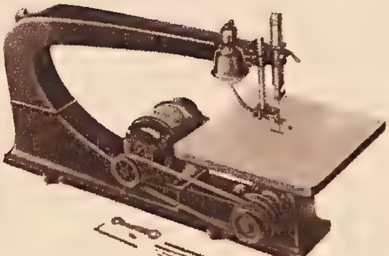
$34.50 Burke & James Solar Enlarger.

Targo
TARGETS
O. F. MOSSBERG & SONS, INC.

19th PRIZE Mossberg "Targo" Home Skeet-shooting Outfit, value $32.10.

20th PRIZE

Zenith "Wavemagnet" Portable Radio, value $29.95.



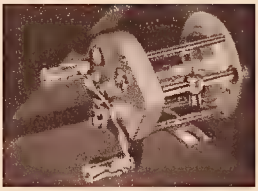
21st PRIZE

Delta $29.90 4-Speed Scroll Saw.

More Prizes!

22nd PRIZE

Foredom Portable Workshop, value $29.45.



23rd PRIZE

$25 Pflueger "Supreme" Fishing Reel.

24th PRIZE

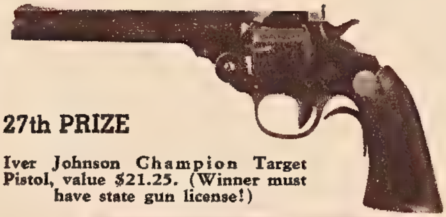
Stanley Tool Chest, worth $25.

25th PRIZE

$23.50 Dremel Moto-Tool Kit.

26th PRIZE

General Electric Triple-Whip Mixer, value $22.75.

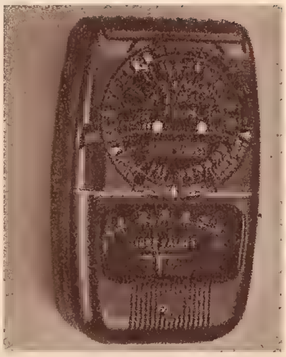


27th PRIZE

Iver Johnson Champion Target Pistol, value $21.25. (Winner must have state gun license!)

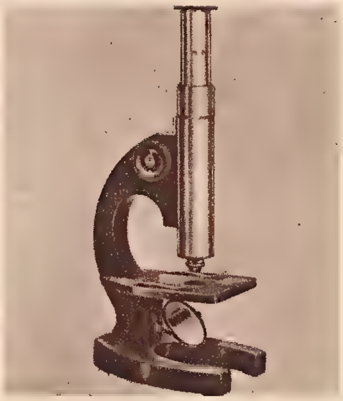
28th PRIZE

$21.90 Federal Enlarger.



29th PRIZE

General Electric Exposure Meter.



30th PRIZE

$21 Bausch & Lomb Microscope.

31st PRIZE

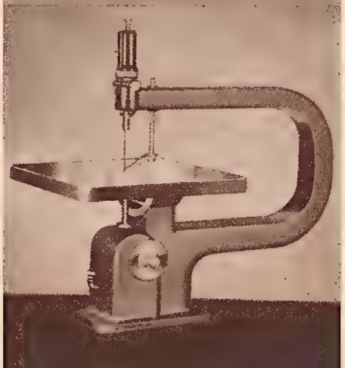
$20 Flexible Flyer "Splitkein" Skis.

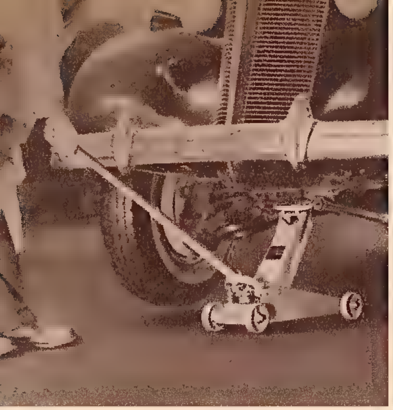
32nd PRIZE

$20 RCA Victor Personal Radio.

33rd PRIZE

Boice-Crane Jig Saw, value $19.95.





36th PRIZE

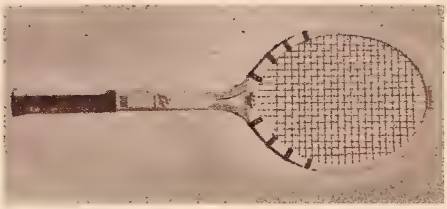
$19.75 Sheaffer Crest Lifetime Ensemble.

34th PRIZE

Hein-Warner Model OS "O'Boy" Hydraulic Jack, value $19.95.

35th PRIZE

$19.95 Motorola Bike Radio.



37th PRIZE

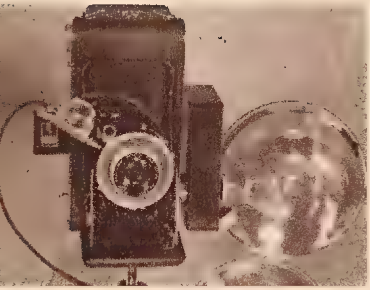
$17.50 Remington Rand Triple Header Electric Razor.

38th PRIZE

$17 Wilson Don Budge Autograph Tennis Racket.

39th PRIZE

Wilcox-Crittenden Marine Compass, value $16.50.



40th PRIZE

$14.95 Kalart Speed Flash Outfit.

41st PRIZE

Casco Electri-Craft Set, value $14.95.

42nd PRIZE

Blackhawk Hexite Wrench Set, value $14.35.

43rd PRIZE

$13.75 J. B. Williams Roto-Shaver.

44th PRIZE

A. C. Gilbert Locomotive & Tender Kit, value $12.50.

45th PRIZE

$11.50 Kalart Speed Flash Outfit.

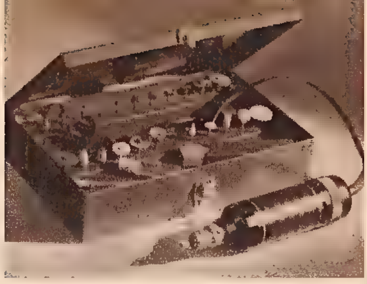
More Prizes!

46th PRIZE

$10.95 Genuine "Alaska" Sleeping Bag.

47th & 48th PRIZES

De luxe "Handee" & De luxe "Artizan" Workshop Tools.



49th PRIZE

Ronson "Crown" Table Lighter, value $10.

50th PRIZE

K-D Adverse Weather Lamp, value $10.

51st PRIZE

Axel "Rainsuiter," value $10.

52nd PRIZE

$10 DeJur-Amsco Exposure Meter.

53rd PRIZE

$9 Utica "Duxbak" Hunting Jacket.

54th PRIZE

G-M Standard Exposure Meter, value $8.75.

55th PRIZE

Kirsten Scientific Pipe, value $8.50.

56th PRIZE

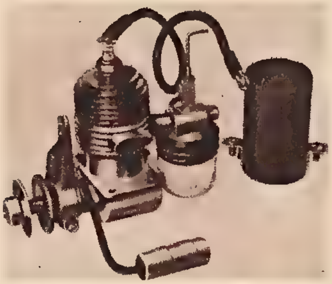
Benjamin Super Single Shot Air Rifle, value $8.50.

57th PRIZE

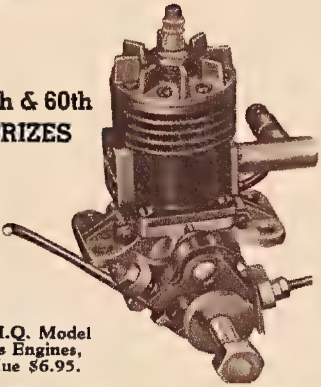
Weed Tire Chains, value $7.75.

58th PRIZE

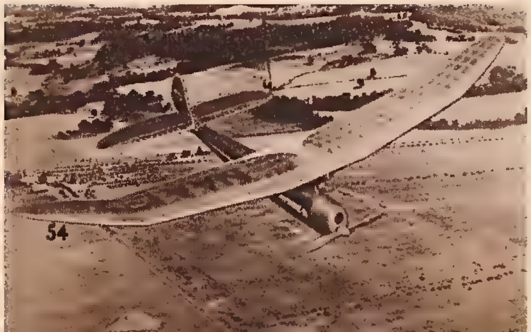
$7.50 Brownie Junior Model Gas Engine.



59th & 60th PRIZES



G.H.Q. Model Gas Engines, value $6.95.

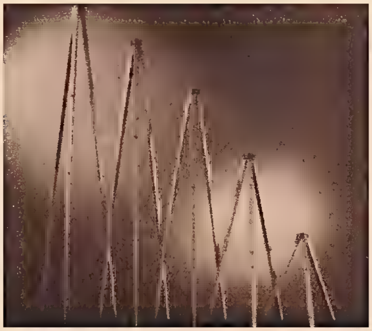


61st PRIZE

Comet Sailplane Gas Model Kit, value $5.95.

62nd PRIZE

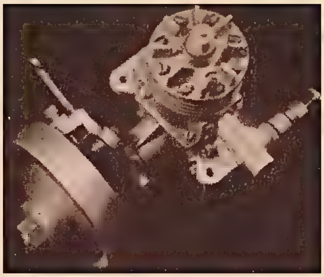
Albert Specialty "Foldex" Camera Tripod.



63rd PRIZE

$5 Gale Kaywoodie Pipe.

64th PRIZE Polaroid Day Glasses.



65th, 66th & 67th PRIZES

Three $4.95 G.H.Q. Motor Kits.

HAYNES
M.C.M.
PHOTOMETER

68th PRIZE

$4.85 Haynes Photometer.

69th PRIZE

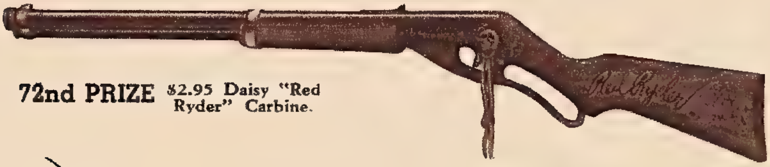
Dremel Moto-Saw, value $4.85.

70th PRIZE

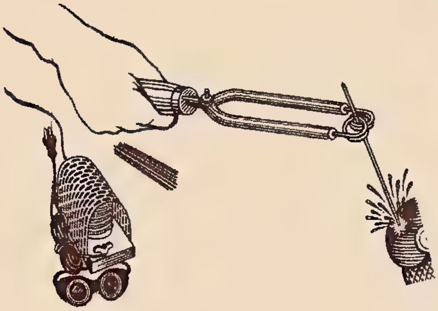
$4.50 Boyce-Meier Sextant.

71st PRIZE

Hull Streamline
Auto Compass,
value $2.95.

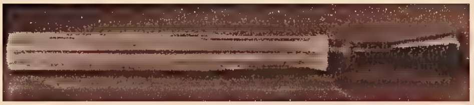


72nd PRIZE $2.95 Daisy "Red Ryder" Carbine.



73rd PRIZE

Handiweld
Electric Welder,
value $2.95.



74th PRIZE

Kirsten Cigarette Holder,
value $2.

75th PRIZE

Hull Pocket Compass.

—AND STILL MORE PRIZES!

Prize
No. SCALE BLUEPRINTS FOR:

76—"Bonnie," 18' Auxiliary Sloop.
77—"Pixie," 20' Plywood Auxiliary Cruiser.
78—"Buzzer II," 14' Outboard.
79—"Zipper," 20' Bilgeboard Scow.
80—"Chieftain," 70 m.p.h. Ice Sled.
81—"MI Whirlwind," Air Driven Model Car.
82—"Electra," Model Cruiser.
83—"XP-3," Gas-Powered Model Plane.
84—"Barbara Q," 15' V-bottom Utility Outboard.
85—"Jitterbug," 17½' Cabin Sailboat.
86—"Midge," 7½' Roped Dinghy.
87—"Mountain Lake," Plywood Skiff.
88—"Zinky Dink," Unsinkable Steel Rowboat.

Prize
No. SCALE BLUEPRINTS FOR:

89—"Tahiti," 30' Ocean Cruising Ketch.
90—"Oriole," 22' V-bottom Cabin Cruiser.
91—"Polaris," 25½' Auxiliary Sloop.
92—"Kingfisher," 20' Raised Deck Cruiser.
93—"Corky," 18' Sailboat.
94—"Pirate Too," 17½' Cabin Sloop.
95—"Sea Rover," 24' Cabin Auxiliary Sloop.
96—"Scram III," 15½' Speedboat.
97—"Cloud Clipper," Passenger Carrying Glider.
98—"Stormy Petrel," 26' Cruiser.
99—"Pilgrim," 22' Auxiliary Sloop.
100—"Super Sunray," Racing Sloop.

Here Are Puzzles Nos. 1 & 2

CONTEST RULES

1. A different "Words-Within-Words" puzzle appears in the February, March and April issues of this magazine. Puzzle Number 2 is on the opposite page. A reprint of Puzzle Number 1 appears on this page, for those who may have missed the February issue. Contestants will complete each of the three puzzles, striving to attain a high score, printing this score in the proper space, marked "Total" on the entry blank. The third entry blank will contain a space to print your "grand total," the total number of points accumulated in all three puzzles.

2. The individual having the largest correct "grand total," as printed on the third entry blank, will win first prize. The individual having the second largest correct "grand total" will win second prize, etc. Duplicate prizes will be awarded in case of ties.

3. Do not send in entry blanks separately. Save blanks until you have all three. Then send them together, by first-class mail, to "Words-Within-Words" Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

4. Contestants may submit legible copies of the first two entry blanks as their official entry if they so desire. The third entry blank must be the one clipped from the April issue of MECHANIX ILLUSTRATED. (Note: This is permitted because we believe contestants may find it possible to secure a larger score after a little practise, and such practise may mess up the original blank. With that in mind you may want to practise a bit on a separate sheet before filling out the entry blank appearing in the magazine.)

5. Webster's New International Dictionary, Second Edition will be considered final authority on acceptance of words used in the puzzles.

6. This contest closes April 1, 1941. Entries postmarked later than that date will not be considered.

7. No entries will be returned, nor can we enter into correspondence regarding this contest. Judges will be the editors of MECHANIX ILLUSTRATED. Their decisions are final. Anyone in the United States and Canada may compete except employees of Fawcett Publications, or members of their families.

CONTESTANTS!

Would you like to have a chance to win a cash prize, as well as one of the regular contest prizes, shown on the preceding pages? If so, turn to page 79 and see how you can win a Cash Sponsorship prize, merely by telling some of your friends about MECHANIX ILLUSTRATED'S great "Words-Within-Words" contest!

Below is a reprint of Puzzle No. 1, which appeared in the February issue. Contestants may use this blank or a legible copy of it, as an official entry in the contest.

PAR FOR PUZZLE NO. 1 IS 225

PUZZLE NO. 1

								TOTAL
C								
R								
A								
F								
T								
S								
M								
A								
N								
S								
H								
I								
P								
						TOTAL		

In The MI PRIZE CONTEST

HOW TO DO "WORDS-WITHIN-WORDS"

Insert on each horizontal line a single word, of not more than eight letters, the first letter of which is already printed on that line. These letters, already on the puzzle and reading from top to bottom, comprise the KEYWORD. Each word you fill in on horizontal lines must consist of letters appearing in the KEYWORD. Any English word appearing in the Webster's New International Dictionary, Second Edition, may be used, provided no letter appears in your word more often than it appears in the KEYWORD. Example: If "T" appears in the "Keyword" three times, it may not be used more than three times in any one horizontal word. No word may be used more than once in the same diagram. Plurals are permissable.

Method of scoring: Each letter in the finished diagram counts one point the first time it is used, two points the second time it is used, three points the third time, etc. In filling spaces, place letters below and their point value above the curved line as shown in the Specimen Puzzle on this page. Thus, above the first letter of the KEYWORD put the figure 1. Place 2 above the letter the next time it is used, 3 above it the third time, etc. Your completed diagram will show a score above each letter of each word. Then total all numbers appearing in each horizontal line. The total of these figures, is your total for the puzzle.

PAR FOR THIS IS 210

SPECIMEN PUZZLE

								TOTAL
1 M	1 A	1 I	1 N					4
2 A	1 C	1 T	2 I	2 N	1 G			9
3 N	1 U	2 T						6
2 U	1 R	4 N						7
1 F	3 A	3 I	2 R					9
4 A	2 G	5 A	4 I	5 N				20
2 C	6 A	3 R	3 T					14
4 T	4 R	5 I	2 M					15
3 U	6 N	6 I	5 T					20
5 R	7 A	7 I	7 N					26
8 I	8 N	9 N						25
10 N	4 U	11 N						25
3 G	6 R	9 I	12 N					30
						TOTAL		210

A par, or average score, will be given with each of the three contest puzzles. Do your best to beat par!

A careful study of the "Specimen Puzzle" appearing on this page is recommended, as it illustrates the correct scoring procedure.

PAR FOR PUZZLE NO. 2 IS 275

PUZZLE NO. 2

								TOTAL
M								
E								
C								
H								
A								
N								
I								
Z								
A								
T								
I								
O								
N								
						TOTAL		

NAME ....

ADDRESS ....

CITY .... STATE ....

If you were sponsored in this contest fill out the following. If not, leave these spaces blank.

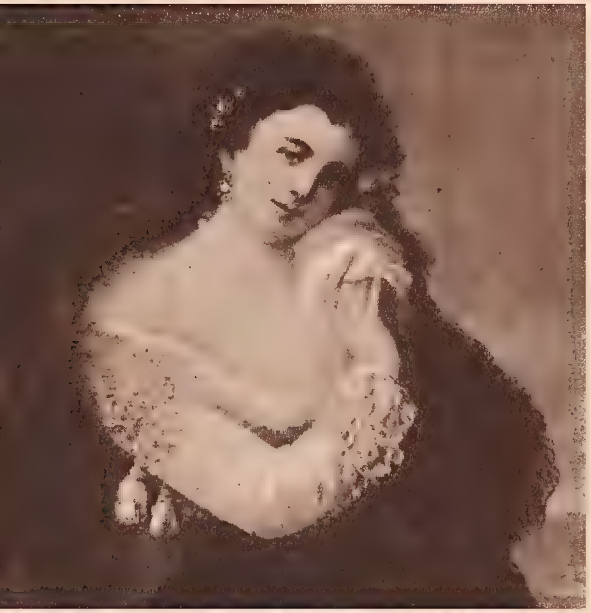
SPONSOR'S NAME ....

ADDRESS ....

CITY .... STATE ....

Save this puzzle and Puzzle No. 1 until you have completed Puzzle No. 3, appearing in the April issue of MECHANIX ILLUSTRATED. Send all three completed puzzles in together.

Secrets of The Old Masters!



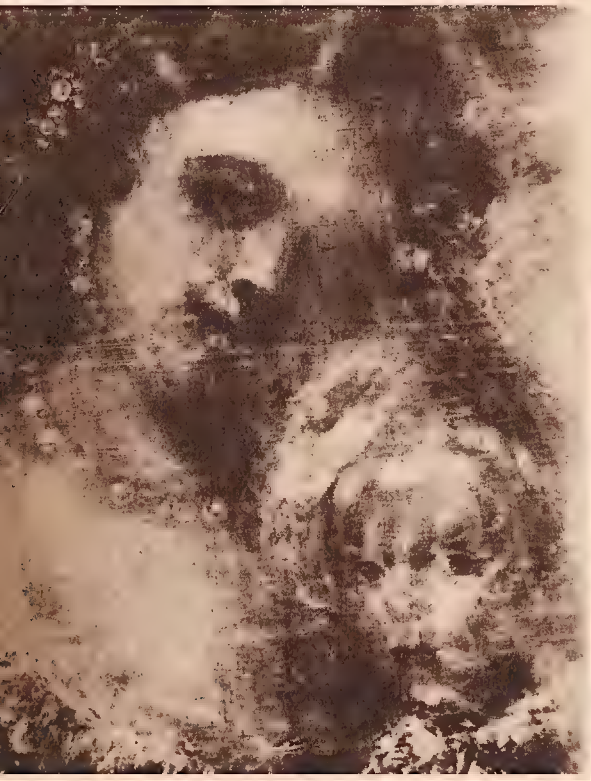
AS THESE pictures show, the X-ray is revealing hidden details of the artistic masterpieces of the past. The old masters used white lead in various parts of their pictures, and white lead, it happens, stops X-rays. That fact makes the present day X-ray "detective work" possible.

Famous artists of yesterday were likely to use white lead most heavily on such parts of a portrait as the forehead and nose—points where the light strikes most powerfully. The parts of the face that appear in shadow, such as eyes and cheeks, are done with other paint.

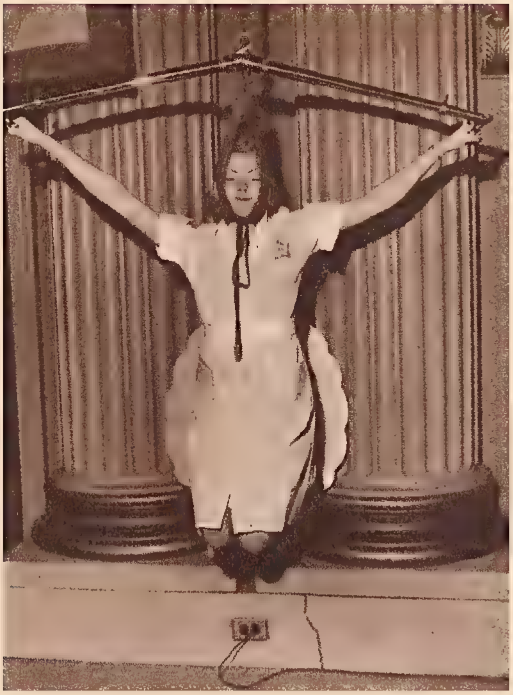
This interesting process was first employed by Mr. Alan Burroughs and Dr. J. Lloyd Bean, a physicist. The first X-rays of paintings, or "shadowgraphs" as the developed films are called, were taken in the Fogg Museum and the Museum of Fine Arts in Boston.

One of the latter museum's paintings, a Holbein portrait of Sir William Butts, dating back to 1543, was "discovered" beneath another painting. The surface painting (which had been thought genuine) was then cleaned off. The real Holbein portrait which had been painted over, was then restored.

Francisco Jose De Goya's "Portrait of a Spanish Lady" shown on this page, is another example of shadowgraph detection. The child had been painted out.



Top: "Portrait of a Spanish Lady." This famous painting shows only a handkerchief where the X-ray shows a child. The curvature of the wrist aroused suspicion that some detail had been painted over. Center: The child revealed by the shadowgraph is expected to be restored. Right: X-raying a portrait in the Dallas, Texas, Museum of Fine Arts. This is very exacting work.



Mechanical Chiropractor

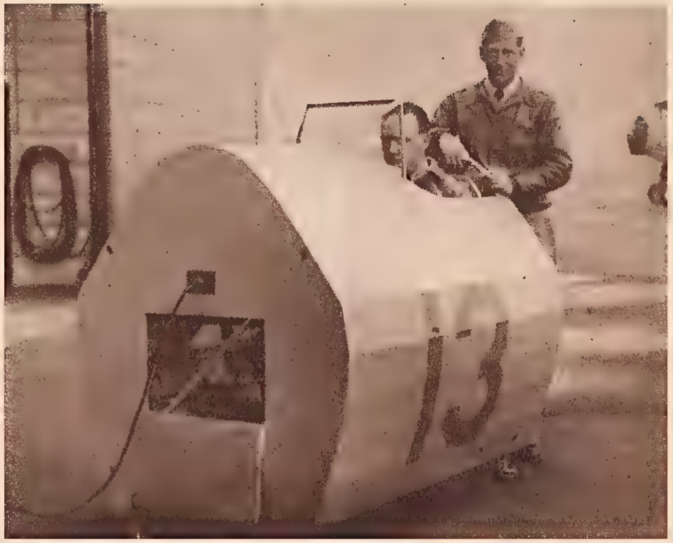
MISS BERYL THORPE doesn't look very comfortable in this exercising and adjusting machine. Displayed at the Inventors of America Show, in Los Angeles, California, the machine stretches muscles. A head and neck exerciser makes the user's neck delightfully limber. The whole apparatus hangs from a hook. You simply get in it and stretch.

8,000 Volts Kill The Mouse

INVENTOR FRANK FORD points proudly to the deadly mechanism of his new electrical mousetrap which was shown at the same exhibition as the apparatus to the left. The trap grabs the hapless mouse by the neck with a pair of pincers, hurls 8,000 volts through it for a quarter of a minute, and then drops it through a trap door into a steel box.

Learn To Fly With Electric Bells

INSTRUCTOR H. G. NICHOLSON, of the Air Corps Training center at Oxnard, California, invented this flight training device. It is a duplicate of a training plane's cockpit, complete with all controls. In early lessons, the controls are connected together to work automatically in proper coordination. Later, when the student must operate them, any mistake rings a bell.



THE SOUND OF

by Jo Ranson and Dick Dorrance

The boys who make the noise are all set to forget their old tricks and learn new ones for radio's new revolution in the transmission of sound—frequency modulation!

With frequency modulation, tea being poured will *sound* like tea being poured, and not like rain on a roof, or the roar of Niagara Falls.

IT'S not too unlikely that if you attend a radio broadcast sometime a few years from now you may find a sign outside the studio door reading: "Please leave all keys, coins and metallic objects here until conclusion of the broadcast."

And then, if you are wearing a dress shirt front, stiff and starched, you may well be stopped by a courteous usher at the entrance to the studio who will say: "Sorry, sir, no persons in formal dress are permitted at the broadcast."

If you do enter the studio, you will probably find when the program starts that the announcer and other principals use no scripts, or maybe have their lines printed on limp, flexible paper that makes no sound.

Sound, you see, is getting to be a problem in broadcasting. Not only extraneous, unwanted noises, but sound that is a perfect reproduction of the real thing, lending a new depth and reality to radio programs as they are heard in the home.

The reason for all these startling changes and many more in the business of broadcasting is contained in two cryptic letters—FM—which stand for "frequency modulation." That in turn means a new kind of radio transmission which has a whole hatful of much-needed advantages.

Probably there is no single group as excited about the possibilities of FM than the sound effects men. These imaginative gentlemen who are daily called upon to imitate every noise from Niagara plunging over a rocky cliff, to the first peep of a newly-born chick, find that FM offers them an immeasurably better

The boiled shirt, as worn by this broadcaster, will be out when the acute ear of FM is widely used.

THINGS TO COME!

The man at the left sawing wood sounds to the listener of this FM station just like a man sawing wood! Note the "ostrich egg" microphone. Above: Major Edwin Armstrong.

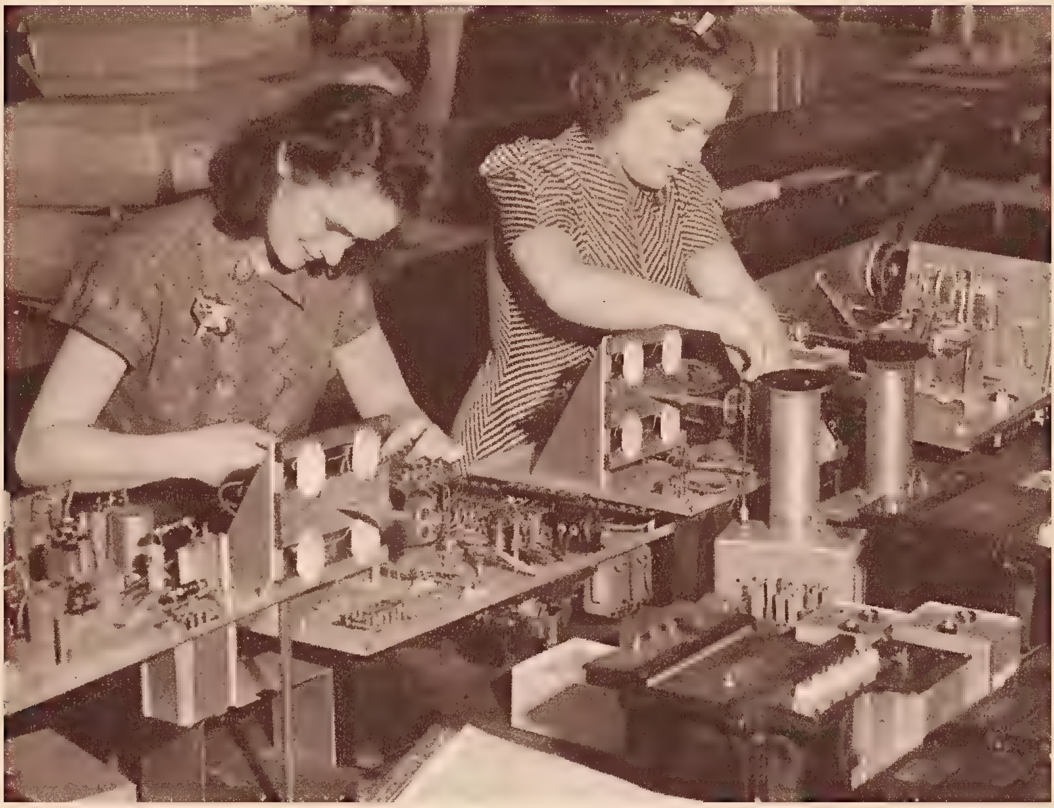
chance to display their talents. FM, you will recall, is the new noise-free, crystal-clear type of radio transmission developed by Major Edwin H. Armstrong, one of radio's greatest living figures (see MI for May, 1940). So great has been the interest of the radio industry in frequency modulation during the past year that at least 200 new stations are expected on the air, operating with FM, before 1941 ends. Because of its complete absence of background "rush" and internal tube noises in the receiver, FM programs come over the air against a background of complete silence. When no music or voices are being transmitted, you cannot tell whether your set is on or off.

FM possesses a tonal range far beyond that of standard, or amplitude modulation (AM), broadcasting, being able to reproduce all notes from the bassiest 30 cycles up to the extreme treble of 15,000 cycles—a range superior even to that of an excellent musical ear.

But most important for the sound engineers is the fact that over FM things always sound like exactly what they are. If you crumple cellophane in front of the microphone—it sounds like cellophane being crumpled and not a raging forest fire. The tinkle of coins is precise, so much so that you can even tell what denomination they are. Bells sound like bells and not buzzers. A gong clangs, and you hear every lingering overtone in a wavering haze of perfect sound.

The sound effects men have not always had an easy life. Everyone has seen or heard of the peculiar contraptions they are often forced to devise when creating a certain noise to the satisfaction of the radio audience.

The life of the sound effects man, ever a squirrelish existence, promises to be even more unpredictable under the influence of FM. The possibility of whole automobiles rolled into the studio, of gravel walks being built on the studio floor, of real rain falling



Skilled in their work, these girls are wiring power units for a General Electric 250-watt FM transmitter.

from the ceiling—are all lively and likely vistas.

NBC, even now, has 16 "gunmen" in its sound effects department who handle the gunplay for radio skits. It has been necessary for the New York Police Department to issue permits to these men because they use real guns. Despite the fact that blank cartridges provide ammunition, each gun is checked twice before being used in the studio.

The playfulness of sound effects men sometimes extends beyond the walls of the broadcasting station. CBS still chuckles over one screwball who operated a complete sound effects set-up at his home near New York's fashionable Sutton Place. His idea of fun was to come home at two in the morning, roll his loudspeaker up to the window, turn the volume on full—and then simulate a train coming into a station.

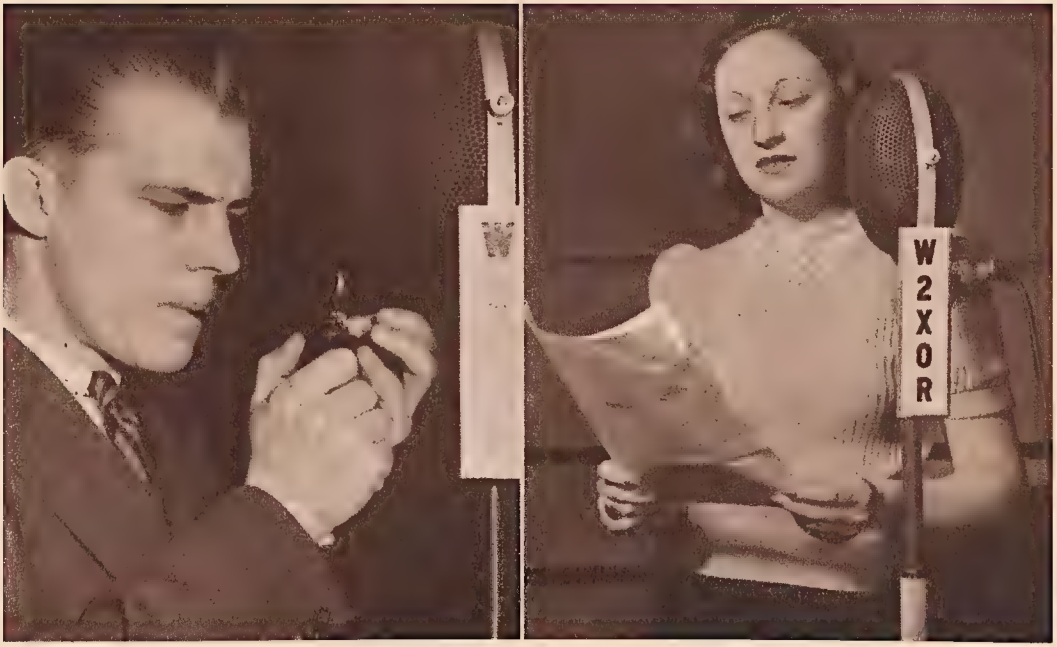
Half-awakened sleepers heard the slowing chug of the drivers, a hiss of steam, a whistle—all in the court of their apartment house. Then a voice would shout "'Board!" loudly, and the mythical train pulled out of the mythical station—leaving the neighbors in near panic.

His other tricks included having a bombing plane apparently dive into the courtyard, engines screaming, then pull up in a sharp dive, followed a few seconds later by the detonations of bombs. A third highly effective stunt featured an auto wreck in the courtyard, with a skid, broken glass and screams. The last item on the program eventually proved so real that it brought two police radio cruisers to the scene.

Listeners are usually rather observant of sound effects on the air. One man—a mechanic—applied for a job at NBC with the following letter: "I have noticed that the gears in the transmissions of all your cars are worn and exceptionally noisy in first and second."

It took the sound men a little while to explain to this individual that if the gears didn't make any noise, the listeners would never know that the imitation automobile was there!

Realism can be carried a notch too far. During a recent Phil Baker program, the



FM will be alternately a delight and a problem to the sound effects men. A man lighting a match, as the one at the left, will be heard distinctly bv listeners. On the other hand, script paper that crackles will be taboo.

necessity for the sound of frying bacon occurred in the script. So the sound men just took a frying pan, some raw bacon, and proceeded to fry it in front of the microphone. It was an audible success — except that the odor wafted up into the air conditioning system and thence all over New York's Radio City!

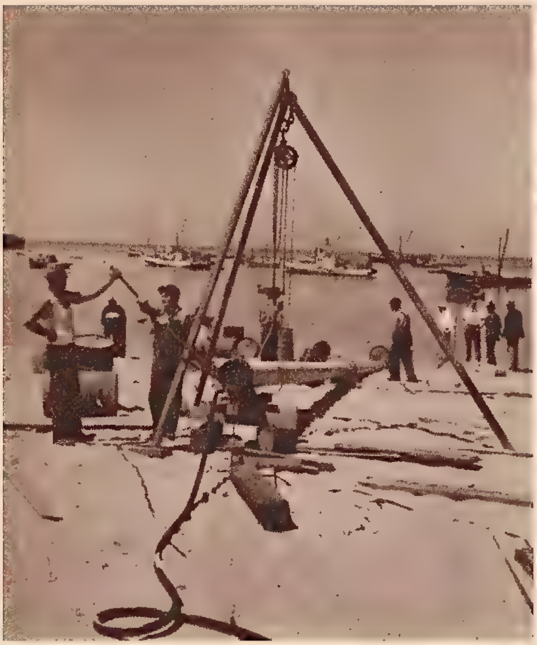
After considerable sniffing, executives traced the lunch wagon aroma and immediately handed down a mandate that in future all cooking in the studios—even for the sake of pure illusion—was out so far as NBC is concerned.

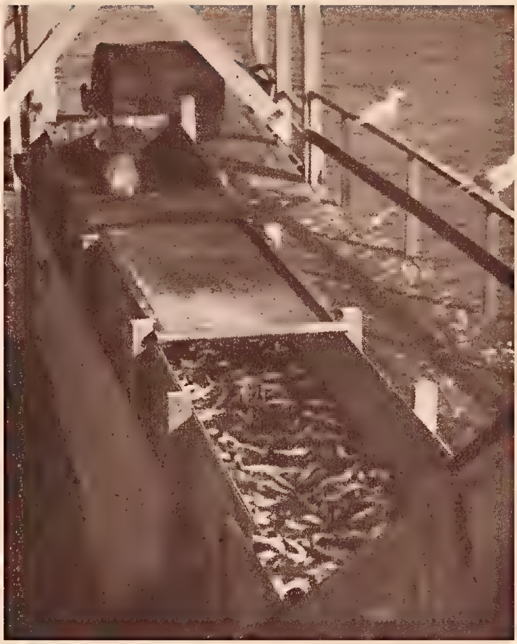
And the business is also fraught with dangers. Recently a noise expert landed in the hospital with a badly cut leg as the result of kickback from a thunder machine. He bumped the gadget accidentally, causing it to swing back and catch him on the leg. The official report was worded: "Wounded on the field of rattle."

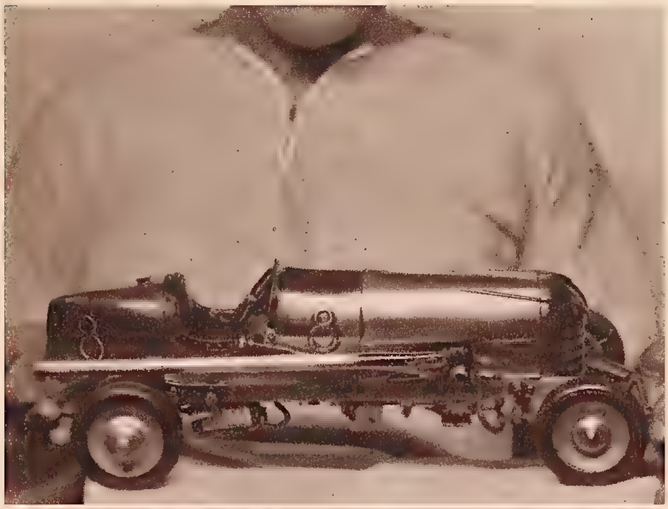
Ray Kelly, who is head of the sound effects department at NBC, feels rather enthusiastic about FM. "There is no doubt," he says, "that FM will prove a boon to the sound effects engineer. It will make things a lot easier than they are now. We won't have the restrictions on high audio volume. I'm referring to the explosion sounds that give us so much trouble—such as pistol shots, thunder,

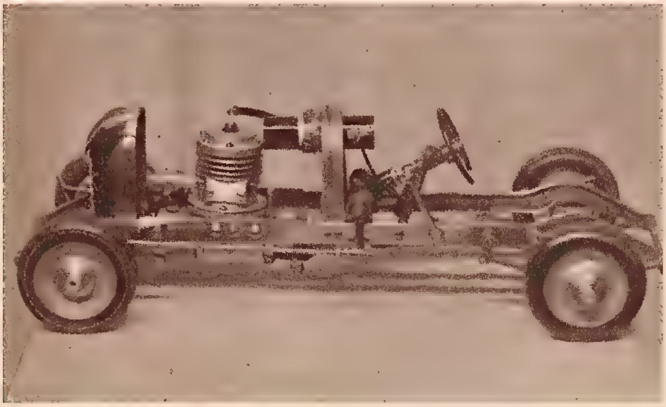
[*Continued on page* 134]

Microphone at New York FM station W2XOR picks up the sound of running water.







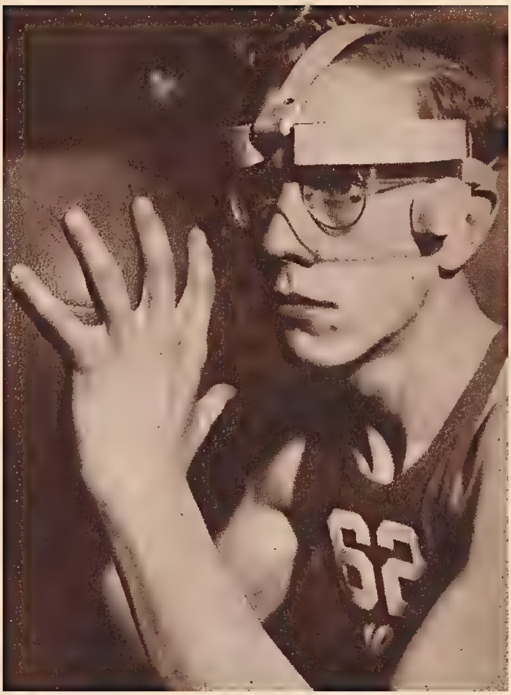


Plumbers' Nightmare —Sardine Pipes

SARDINE canners of Monterey, California, sent thousands of tons of sardines swirling through pipe lines from fishing boats to cannery, in the 1939-1940 season. The rugged shoreline makes boat landing difficult. The answer is the type of pipe line shown under construction at the upper left. Upper right picture shows entrance hopper. The fish are pumped through.

Fully Equipped Model Race Car

THIS miniature race car has four wheel brakes, fingertip controlled clutch, worm and sector steering, and outboard spring suspension. The body, resembling a piece of jewelry, is of German silver with a silver trimmed bronze radiator shell. Built by Will F. Kelly, of Michigan City, Indiana, the model attained estimated speeds of 40 to 50 m.p.h. in tests.



Built-In Car Showcase

GEORGE DRESCHER points to the glass covered showcase built into the luggage compartment of a traveling salesman's car. This useful sales accessory was exhibited at the 21st Automotive Service Industries Show in Chicago. There are several glass topped drawers in the unit, one of which is shown pulled out to its maximum extension. It can be withdrawn to the compartment.

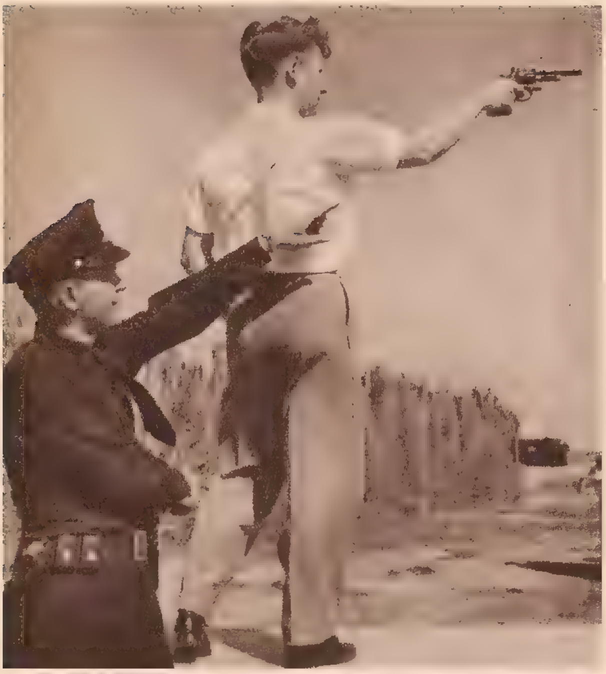
Plastic Eyeglass Guard

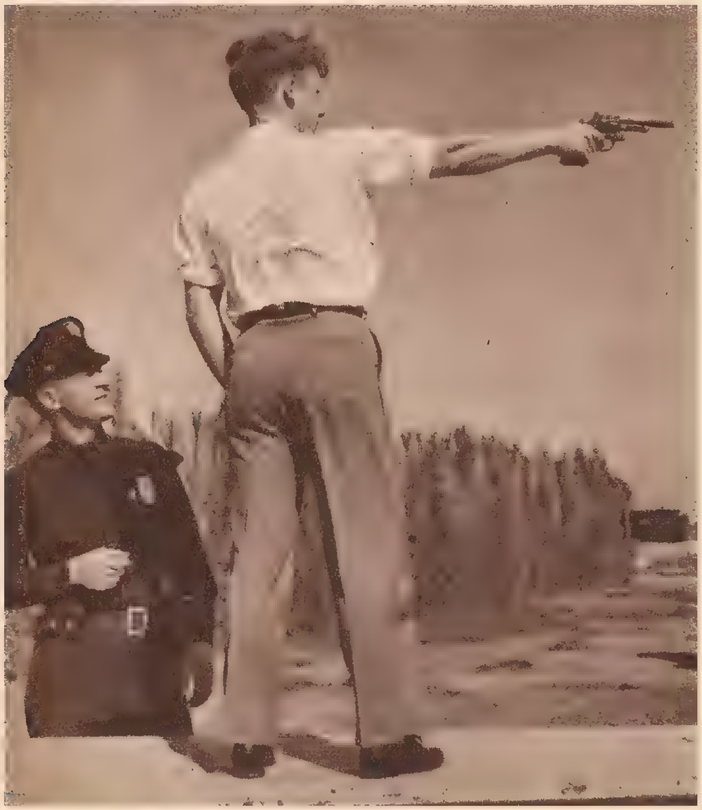
THE eyeglass protector on Detroit's Dick Dikeman is hardly visible. It is made of a new non-breakable plastic, and cushioned against the forehead and cheeks with sponge rubber. A cloth strap arrangement over the top of the wearer's head and behind it, holds the guard in place. Although this device affords adequate protection during sports competition, it does not block vision.

New Glass Cloth For Airplane Wings

C. G. TAYLOR, president of the Taylorcraft Company stands with chief test pilot James Ludwig while the gentleman with the torch tries to burn a hole in the glass cloth covering on a Taylorcraft wing. The new woven glass cloth is known as Fiberglas, and will not burn. It does not absorb moisture, nor does it rot. It has an extremely high strength-weight ratio.

Bullets to The Bull's-Eye!





Long Beach is training civilians to be crack shots with a pistol in a ten-day "short cut" course. Here's how it's being done!

by Richard W. Emery

TWO hours of study, ten shots a day for 100 shots, and you'll be at least a fair pistol marksman—not ready to break a world record, but a good, solid, safe pistol shooter who can make the bull's-eye look pretty sick!

That's the guarantee of the Police Pistol Club at Long Beach, California, which recently started the first mass training of civilian pistol users on the West Coast.

"It can't be done," several bemedaled marksmen said when the club announced its plan. "It takes months, even years, to learn to shoot a pistol."

After seeing the club's graduates in action, the scornful experts have had to eat their own words!

Using a hurry-up, short-cut course, the club is drilling shooters by the hundreds. The course is based on the psychological fact that habit patterns are formed by the repeating of identical acts over a period of time. It's a high-hat idea, but it's no pipe dream. It was outlined by William C. Wright, Long Beach chief of police, a Texan, who by anybody's reckoning must be classed as an expert pistolman.

A rookie learns the right way. The top photo shows him in a wrong pistol-shooting posture, with his right arm bent and his weight thrown to his right foot. The lower picture shows him after the faults have been corrected—the right elbow is straight and the weight is placed evenly on both legs.

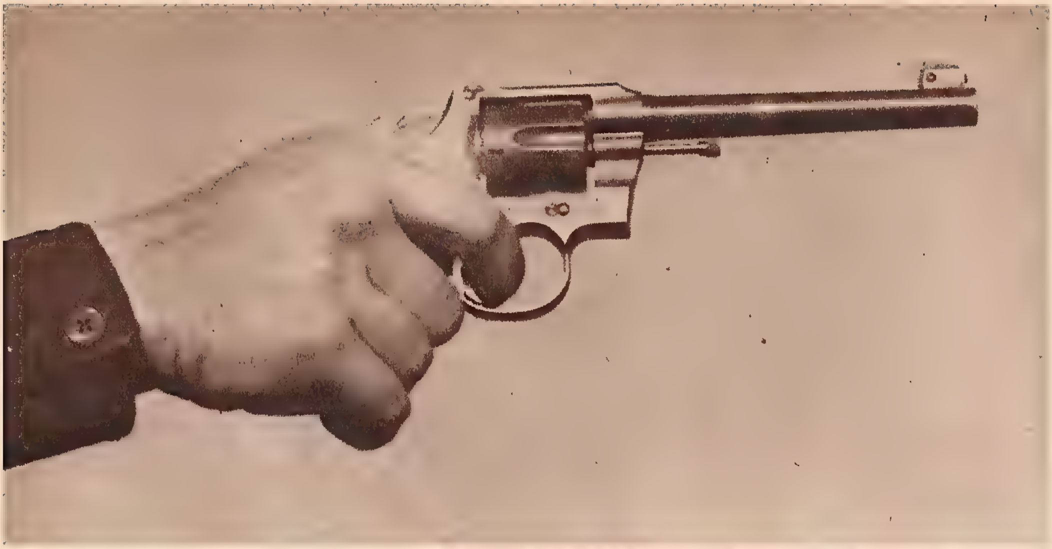
Ten shots a day, in ten days of shooting, will make good pistol shooting form a habit. The marksmen above are using a 25-yard range on the Police Pistol Club course, at Long Beach, Calif. Notice that all of them use the same stance.

Here's the array of targets on the 25-yard range used by the Long Beach marksmen. The targets are about two feet square.

The course is being taught by Rangemaster Malcolm McGuire, a tough, stocky, blue-eyed police officer, ex-Navy instructor in the rough-and-ready use of Navy .45's. Sixty marksmen from the police department and sportsmen's clubs are helping out; the lessons are free, and the instructors serve without pay.

Suppose you are enrolling for the short-cut course. You drive to the range on a sunny morning. Already the racket of .22's, .38's and .45's roll from the long gray shed over the firing line. You join other rookies on a bench and you hear McGuire launch into an A B C lecture on pistols.

"If you have normal health and fair vision, with or without glasses, you can learn to shoot in this ten-day course. When you graduate, you won't have the bad shooting habits that handicap untrained shooters. For your first



Here's the proper pistol grip, as seen from the right. The index finger is on the trigger.

Known as the "rookie squint," the one-eye aim shown above is not recommended for marksmen. Both eyes should be open, as shown on opposite page.

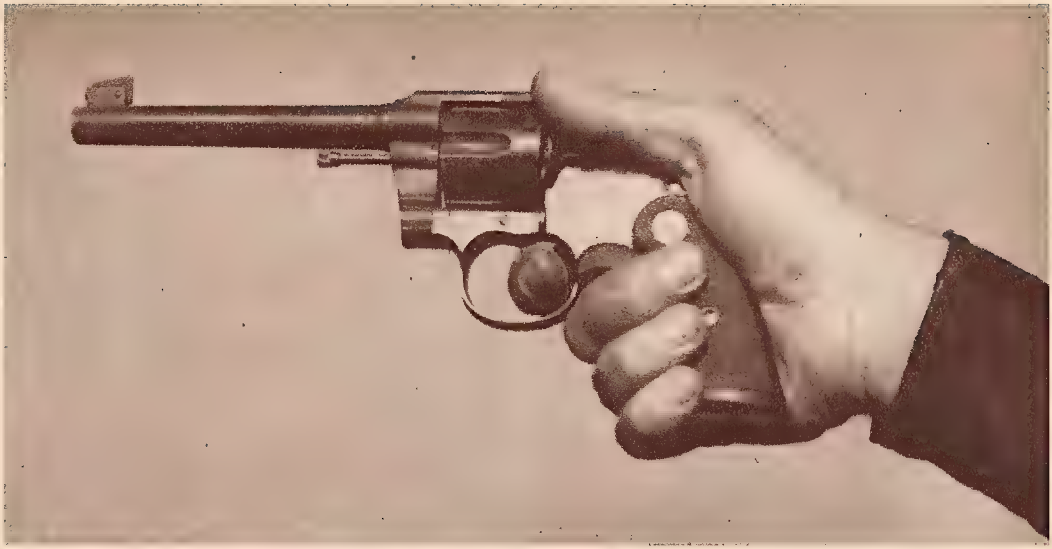
gun you should choose a pistol of moderate caliber, preferably a revolver. You should use shells of mid-range load, instead of high-powered shells, so that you won't develop a flinch from recoil."

Demonstrating as he talks, McGuire shows how the typical beginner, without training, starts out wrong, facing the target square-away, standing off-balance, bending arms and legs, squinting one or both eyes, and otherwise taking positions which will handicap him.

Then he shows you how to stand properly. Your position will vary slightly according to your build; it must be a comfortable position in which you can relax. Your left foot should be at right angle to the line of fire. Your right foot, a half-step away, should be pointing toward the target, or somewhat to your left of the target. Your weight should be borne equally on your two feet, well forward on the balls of the feet. Your body should be erect with head up and left arm relaxed.

"Keep both eyes open and focused on the target," McGuire says. "The pistol, when ready to fire, will lie along the line of vision of your right eye. Your right arm should be straight, but not strained. Only the shoulder joint should move as you sight your gun; the elbow and wrist must not be flexed. That way, the pistol is an extension of your whole arm, easy to aim."

McGuire demonstrates how to hold a pistol in left hand and load it with right hand, al-



Here's the advised grip, seen from the left side. Note how the thumb is held high against the gun.

This officer shows the right way to aim. Although only one eye sights along the pistol, both eyes are held open. The high thumb helps to steady the gun.

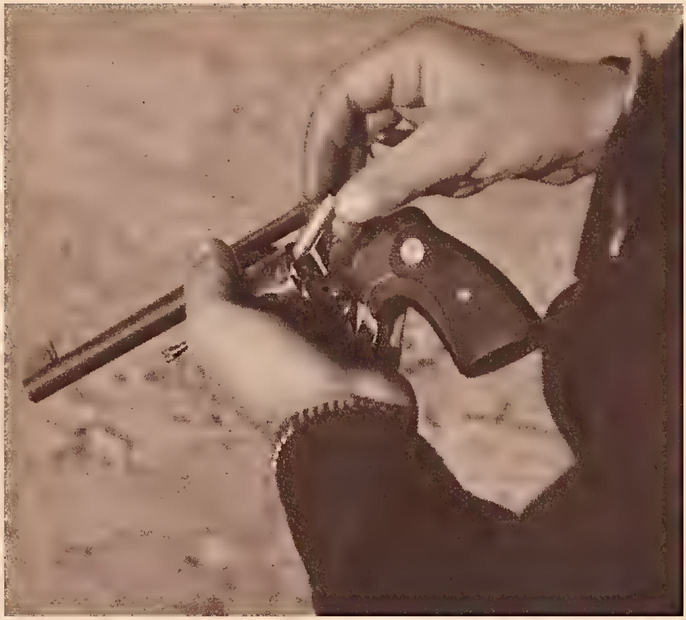
ways keeping the barrel pointed earthward. The two-hour study ends with an emphatic lecture on safety, covering the standard safety rules on the handling of firearms. He tells you to imagine that your gun is a machine gun, always firing. You must keep it pointed, loaded or empty, where it can't do damage. The safety position for the pistolman is the "raise pistol" position, in which the gun is held at half armslength, pointed at the sky.

You and the other rookies now take firing positions on the target range, facing targets 25 yards away. The targets are about two feet square with bull's-eyes as big as saucers.

Your first firing is "dry firing" with an empty gun. Over and over again, while instructors watch your position and correct your faults, you pick up your gun, keeping its barrel pointed out toward the target; fit the gun into the grip of your right hand, take your stand in firing position, and keep your aim all the way through a careful three-or-four-second squeeze on the trigger.

"Don't try to fire at the precise instant when the sights are aligned on the bull's-eye," McGuire warns you. "The jerk will throw your aim off. Keep your aim as best you can and gradually squeeze the trigger; your accuracy will be much better that way and will improve with practice."

Finally you load your gun. You repeat the aiming and trigger-squeezing; the gun barks, the sharp recoil lifts your hand—and presto!



Correct position for the gun in loading. Barrel points down, left hand grips the gun securely around the trigger guard.

A tiny black mark appears on the target! You place the gun on the table and relax your arm for one minute before trying again. In that manner you take nine more shots, finishing Lesson No. 1. Instructors take care that your position is correct for each shot.

Those ten shots are a minimum for each lesson, not a maximum. Shoot more if you want, but make sure that you shoot in proper form, squeezing the trigger. After the second or third lesson, have someone else load your gun, half with empties and half with loaded bullets.

If you are developing an unconscious flinch at recoil, a very common fault which handicaps almost every beginner, this stunt will help

The entire Long Beach city council enrolled in the Police Pistol Club's classes for civilian shooters. The councilmen, city manager and chief of police are shown here as they inspect the police instructors.

you to correct your ways.

There is no reason why anybody with fair vision can't learn to shoot a revolver properly just as easily as the civilian students at Long Beach's Police Pistol Club.

Just remember the rules: Start off with mid-range load shells rather than high-powered shells; stand erect, with head up, left arm relaxed, and your weight evenly distributed on both feet, with the right foot pointing toward the target and the left foot, half a step back, at right angles to the line of fire.

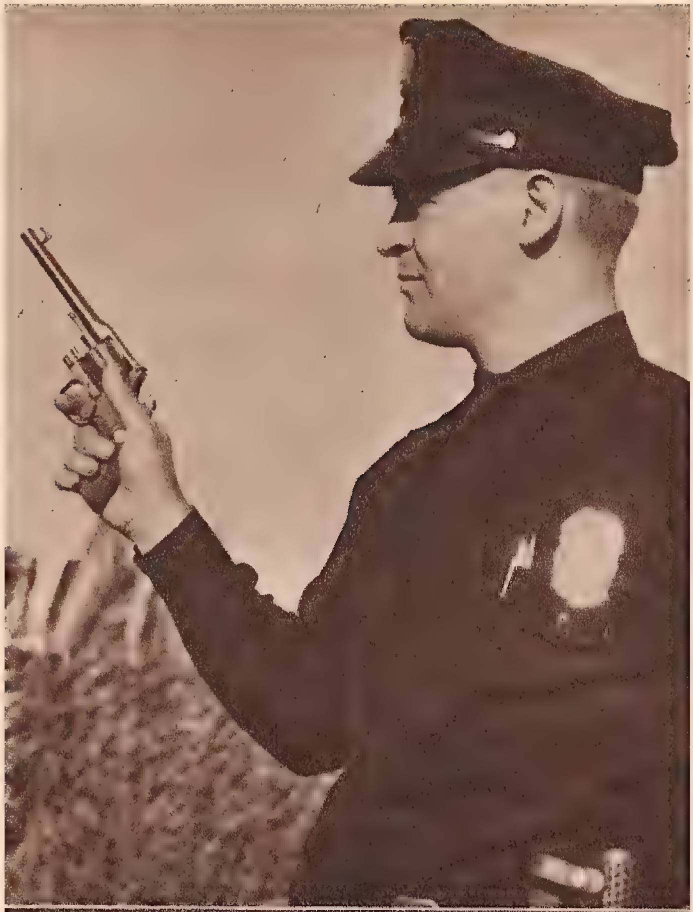
Keep both eyes open and focused on the target; have the right, or shooting arm straight but not strained; move only the shoulder joint when you sight the gun; take three or four seconds to squeeze the trigger after getting your target sighted.

As you gain experience you will develop an "easy" mental and physical attitude when shooting. A tense, nervous posture is one of the outstanding drawbacks common to amateur marksmen. The tendency of many beginners is to "jerk" the trigger the instant the sights find the target. This hasty firing defeats the purpose the marksman is attempting to achieve. The pistol is far less likely to wander from its intended mark if fired in a more deliberate manner. Much time can be wasted by starting wrong.

Above all, remember the rules of safety—gun pointed earthward or skyward when not being aimed at the target!

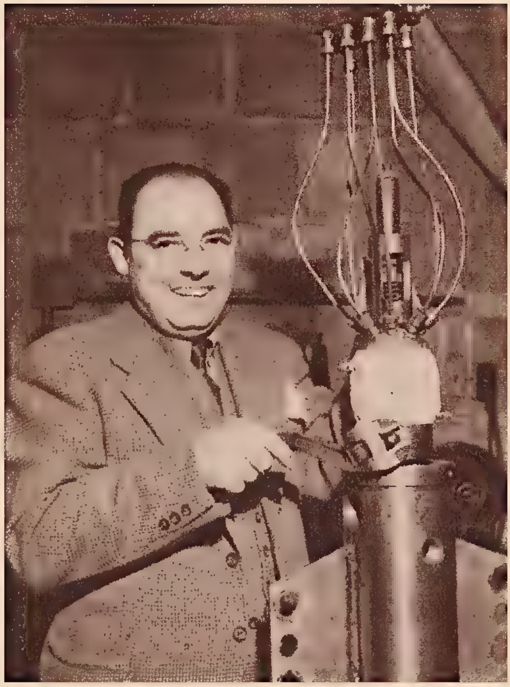
If you correct your form by careful adherence to these rules and by studying the pictures on these pages, you will find when you finish your ten days of shooting, that you'll be shooting in good form.

You'll be putting bullets in the bull's-eye!



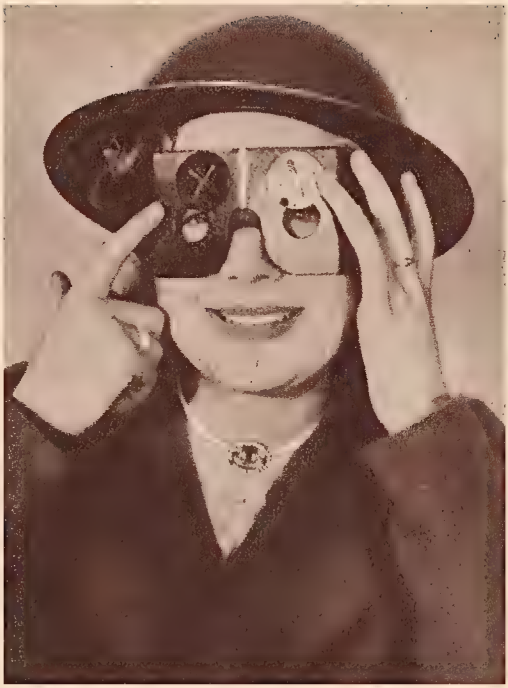
The safety position for the pistolman is the "raised pistol" position shown above, in which the gun, at half arms length, is pointed skyward.

Choosing the right type of gun is important. Pupils of the course are shown various types of pistols and are helped in their selection of a gun. The upper gun shown is a .45 Colt automatic, the lower a .38 Colt revolver.



War Plane Blast-Engine

E. B. MYERS, of New York, wields a wrench on his newly invented jet reaction motor. Using fuel which Army experts say is as powerful as TNT, the new power plant is known as a blast engine. Its operation is similar to that of a rocket except that its power impulses are intermittent instead of constant. It may add 200 m. p. h. to war plane speeds, hence it is kept under guard.



Bomb Proof Eye-Guards

ENGLAND offers these cross-slit eye protectors for the use of those who are likely to be caught in air raids. Rubber padding between the steel front and the wearer's face absorbs the shock of impact if a bomb fragment strikes the device. It is, of course, designed only for protection from the smaller fragments. When not needed, disc shutters are opened.

Retractable Curb For Varied Traffic

CHICAGO'S new 8-lane access highway to the business district boasts of hydraulic curbing sections. When the incoming traffic is heavy, the curbs are lowered to widen the incoming lane. When the traffic reverses in the evening, the lowered curbs are raised and the outgoing lane widened. The retractable curbing extends over 6½ miles. Electric power operates the hydraulic system.

You're RIGHT — That's WRONG!

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. The famous Hope diamond is not white, but brilliant blue.
True ☐ False ☐

2. A socket wrench is a trick used by skilled wrestlers to force an opponent to the mat.
True ☐ False ☐

3. A toxophilite is a doctor who specializes in the development of antidotes for poisons.
True ☐ False ☐

4. A pinhole camera is not suitable for use in photographing fast action pictures.
True ☐ False ☐

5. The United States Patent Office issues patents for other things than mechanical devices.
True ☐ False ☐

6. A saw horse is a small, but powerful mule used in the lumber industry for hauling freshly cut logs to the mill.
True ☐ False ☐

7. Pythagoras are the largest and most deadly of all known tropical reptiles.
True ☐ False ☐

8. A pterodactyl is a colloidal fluid from which the modern tough and transparent resins are made.
True ☐ False ☐

9. When one airplane is overtaking another, it must pass the slower plane on the right, not on the left, as would be the case on the highway.
True ☐ False ☐

10. Myopia is not an African seaport, but nearsightedness.
True ☐ False ☐

11. Dr. Rudolf Diesel, inventor of the Diesel engine, disappeared from a steamer on Sept. 30, 1913, and has never been seen since.
True ☐ False ☐

12. The United States Government does not charge for airplane pilots' certificates.
True ☐ False ☐

13. All licensed aircraft flown in the United States are required by law to be equipped with wheel brakes.
True ☐ False ☐

14. A bo'sun's pipe is a large water-cooled tobacco pipe smoked by sailors to repell sea gnats.
True ☐ False ☐

15. Glenn Curtiss once made a world's speed record on a motorcycle.
True ☐ False ☐

16. A $15,000 prize was offered at one time for the successful designer and demonstrator of a twin-engined airplane.
True ☐ False ☐

17. A stereopticon is a device used by surgeons to locate inedible articles swallowed by infants.
True ☐ False ☐

18. A new American helicopter has demonstrated its ability to fly forward, backward, sideways, straight up, and straight down, with its pilot at the controls.
True ☐ False ☐

19. Motorcycles first made their appearance in France and Germany in 1885.
True ☐ False ☐

20. A rocker arm is a rheumatic elbow joint, so called from the ancient belief that rocking chairs caused it.
True ☐ False ☐

21. "Print dodging" is an expression applied to photographers who dislike publicity.
True ☐ False ☐

22. A radial engine and a rotary engine are one and the same thing.
True ☐ False ☐

23. The thin sheets of wood that make up plywood are not sawed from the logs, but are cut with a knife on a gigantic lathe.
True ☐ False ☐

24. The front of an airplane propeller blade is known as the back.
True ☐ False ☐

25. A Wooly Saki is a tropical American monkey with a long bushy tail and loose whiskers.
True ☐ False ☐

WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 148

No Bugles—But What Bells!

CORPORAL J. L. DE COODT grins at the alarm clock in his hand. He's pressing a button that will awaken a portion of the 174th Infantry at Fort Dix, New Jersey. The bugles no longer blow at Fort Dix when the dawn is breaking. A new electrical system rings bells to do the job instead. The wiring now bears the brunt of the angry looks formerly cast at the bugler.

Jiggle Machine For Muscles

THE box this man is standing on can jiggle him up and down 2,100 times per minute. It provides exercise for those who would not bother to get it by any other means. No exertion is necessary—you just stand up and let it send its super jiggles through your body. It is said to increase circulation and relieve insomnia as its vibratory massage is conducive to sleep.

Depth Perception For Flying Cadets

CAPTAIN M. H. Saffron, flight surgeon, watches closely as George Stallings takes the rigid depth perception test given to Flying Cadets. The box at the far end of the room contains one rigid post and one sliding post which Mr. Stallings must succeed in placing side by side. When the test begins, the would-be pilot does not know which post is nearer. He must determine their position and align them by pulling strings.

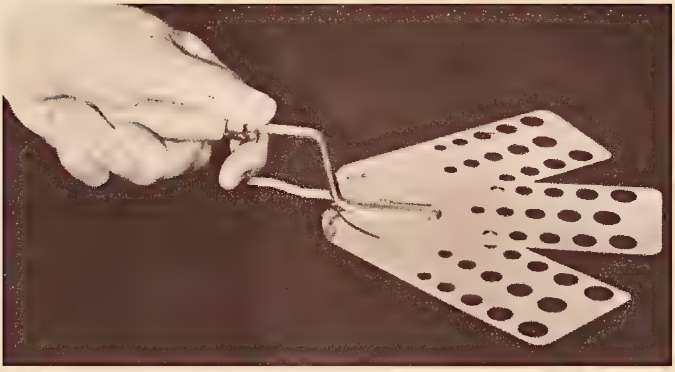
GADGET MAN!

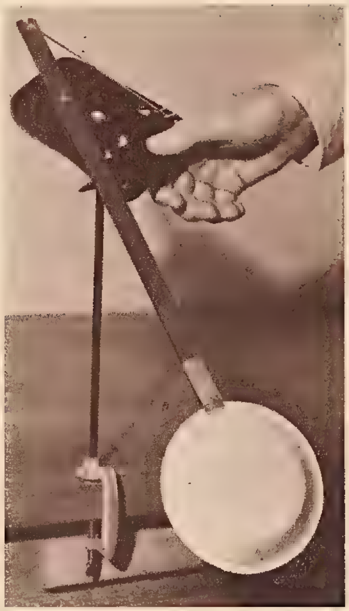
There's a fortune in small gadgets if you know how to pick out the right ones!

by

Andrew R. Boone

R. H. Whyman is shown testing a question and answer bank. Intended to coax children to save, Madame Melba, on top, responds to questions by nodding or shaking her head when a coin is deposited in the box.





Two women suggested the three-bladed spatula, at the left, for lifting such difficult foods as meat loaves and fowl. Pulling the trigger causes the two side blades to fan outward. At the right, is a throwing arm which enables children and adults to engage in the game of parlor skeet.

SCIENTISTS will tell you there's nothing new under the sun.

As an engineer-gadgeteer, R. H. Whyman dissents. To prove his case, he points to a record of more than 1,500,000 copies of gadgets he's turned out during the last seven years from a tiny shop in Los Angeles, California. Three-bladed spatulas, repeating rifles which shoot elastic bands, question-and-answer banks, indoor skeet games, lighted boudoir cologne bottles. He's actually built 100,000 four-shot rifles in twenty days!

Until 1934, Whyman never dreamed that one day he would be turning out trinkets in staggering numbers. Years earlier he'd learned engineering at the University of Wisconsin, and one fine spring morning of 1934, while on the train between Salt Lake City and Los Angeles, he chanced to talk with the manager of a five-and-dime store. Whyman at the time was selling agricultural and road-building machinery.

"Small profits and quantity sales," remarked his companion, "spell success for the dime stores." The idea struck Whyman that the same principle could be applied to a manufacturing business producing inexpensive novelty items. On reaching home, he broached the idea to his wife. "Fine," she agreed, "and because you can't name them,

Thirty-two ties can be hung on this four-tier rack, which measures only four by nine inches, and swings outward when ties are needed.

Whyman's newest gadget is the towel holder, shown above. You simply press the corner of the towel into the center of the slotted rubber disc. Below, a rubber band pistol being used on a trick target; the squirrel jumps when hit.

call your firm the 'Gadget Manufacturing Company.'"

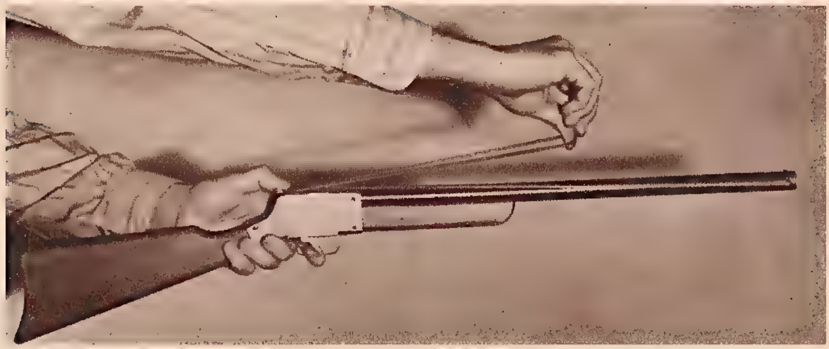
The engineer set up shop in Los Angeles' industrial district and began seeking items. Scores of inventors knocked at his door, and one day two women laid a spatula on his desk. It resembled an ordinary flapjack turner, but when Whyman pulled a trigger two leaves flew out sideways. "That," explained the ladies, "enables the cook to lift meat loaves, soft-crusted pies and fowl."

After trying the gadget at home, Whyman made a few improvements, and it wasn't long before 50,000 housewives were flipping the leaves out and slipping the triple-bladed contraption under foods which formerly crumbled when they were lifted from the pan.

What spells success for a gadget? There is no sure fire rule by which sales may be gauged, Whyman tells you. Public acceptance is fickle. They may buy hundreds of thousands, or turn a new item down cold. Each is a gamble.

After analyzing, figuring costs and discussing the possibilities of improvements on several thousand ideas, Whyman has hit only three or four which really proved profitable. He keeps his door open to inventors, always hoping to see the "one in fifty thousand," which will click in a big way. By that, he means something which will sell a million copies a year for five or six years.

Often one gadget leads to another. Some months ago, he turned out several thousand small repeating rifles which shoot elastic bands. Made of 10 parts, including a wooden barrel painted black to resemble metal, one gun takes four rubber bands fitted over a notch in the muzzle and stretched back to a four-pronged ratchet which is rolled back one-quarter of a turn to cock the piece. When the trigger is pressed, the ratchet flies



Above is a corner of Whyman's "Arsenal." Made of ten parts, 100,000 of these realistic guns were manufactured in twenty days. At the left is a closeup of the gun, showing how it is "loaded" with ammunition—rubber bands.

Below: The framette—four pressed corners are held around a picture by an elastic band.

back a quarter-turn, releasing one band.

They sold well enough, but Whyman wanted to stimulate interest among grown-ups as well as children. Shortly, he perfected a throwing device which sails four-inch paper plates across the room. These consist of a metal arm fitted with metal fingers, and apparatus for holding the upper end of the arm back in the firing position. By pressing a trigger, the arm flies forward. Thus was born the game of parlor skeet, and soon afterward he turned out 100,000 repeating rifles during 20 working days. "This sort of game appeals," according to Whyman, "because Dad and the kids can compete indoors on cold winter nights without danger of injuring anyone. The bands are accurate for 20 feet, and a youngster with practice can hit the plate four times in five."

Most inventors fail to consider production

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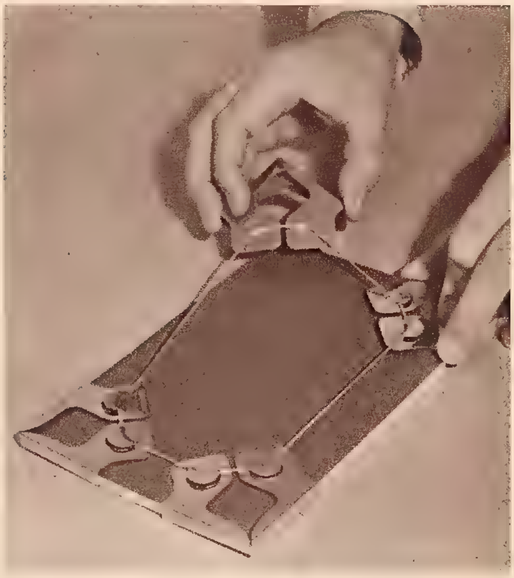

Musical Number, Please!

Record finder Helen Petkan scans the cross index for a requested melody.

A NEW mechanical aid to the nocturnal rhythm purchasers has arrived. It is the telephonic record player. An adaptation of the familiar musical number machine, it offers a choice of 8,000 tunes instead of twelve. In its simple form, the juke-box is complete with coin slots, colored lights and automatic record changing mechanism for a stack of 12 to 24 discs. But during the past year, the juke-box has been menaced by science's onward march. A chain system of juke-boxes, all wired to a central studio with a practically unlimited choice of records, found many subscribers. One of the largest companies in the new wired juke-box field, began by supplying 32 Detroit night spots. When a patron drops a nickel in these new machines a soft, feminine voice inquires, "What is your selection please?" The patron then speaks the title of the number he wants, into the microphone atop the machine.

In their telephone room, girl operators, working six hour shifts with telephone girls' headsets, parade back and forth before long rows of phonograph turntables, supplying different bars and night clubs. As patrons drop their nickels into the slots and make their requests, the operators consult their elaborate cross-indexed file, pick the disc from among 8,000 titles, play it back to the place the request comes from.

To music-hungry revelers, the climax of

[Continued on page 142]

When the music loving cafe patron at the left drops his nickel into the slot, one of the operators (above) locates his selection from among the 8,000 records in the vast files.

YOU Can Win CASH, Too!

ON PAGES 48-55 appear pictures of valuable prizes as they are to be given free to readers of MECHANIX ILLUSTRATED. You probably know all about the big contest by now, but you must have several friends who would like to know about the "Words-Within-Words" game and the valuable prizes, too.

There are enough prizes for all, so why not make a list of friends you know will be interested in this contest and whom you believe have the skill with which to win?

By so doing, you may win one hundred dollars, cash!

See your friends personally, telephone them, or send them one of the coupons at the bottom of this page. Be sure they put YOUR NAME on the contest entry blank as sponsor.

That's all you have to do!

SPONSOR PRIZES

1st Prize	$100
2nd Prize	$ 50
3rd Prize	$ 25

In addition, there are five more prizes of $5 each!

If one of your friends wins a prize, YOU, as his or her sponsor, will be eligible for a *cash* prize for having introduced a prize winner to the contest.

The person who sponsors the winner of the biggest prize will receive $100. The sponsor of the individual winning the second largest prize will get $50. The sponsor of the winner of the third largest prize will get $25. In addition, there are five more prizes of $5 each.

That doesn't mean you have to sponsor the winner of the 1st prize (A Taylorcraft airplane) to win $100. The winner of the first prize may not have a sponsor. The $100 may be won by someone sponsoring a minor prize winner!

Sponsoring one or more of your friends does not injure your chances of winning a prize in the "Words-Within-Words" contest, but gives you a chance to take in a CASH PRIZE as well as one of the big contest prizes.

All you have to do is let your friends in on this big contest. Tell them to put you down as their sponsor and you automatically become eligible for a cash sponsorship prize!

Be sure, though, that you, as sponsor, select entrants skillfully, sponsoring those persons you believe are capable of winning a prize in the "Words-Within-Words" contest.

Dear

I think you can win a Taylorcraft airplane or an Indian Motorcycle free!

If not one of those prizes, a camera, a set of tools, a power lathe, a portable radio or one of a hundred valuable items. For details see the "Words-Within-Words" contest in the magazine MECHANIX ILLUSTRATED. It's now only 10c at all newsstands.

I hope you enter. If you do, I may win $100 as your sponsor. Don't forget, put my name down on your entry blank as sponsor!

There are no catches in this contest. No slogans to think up. No essays to write. The highest score wins and I'm sponsoring you because I think you can win.

Your friend

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Your friend

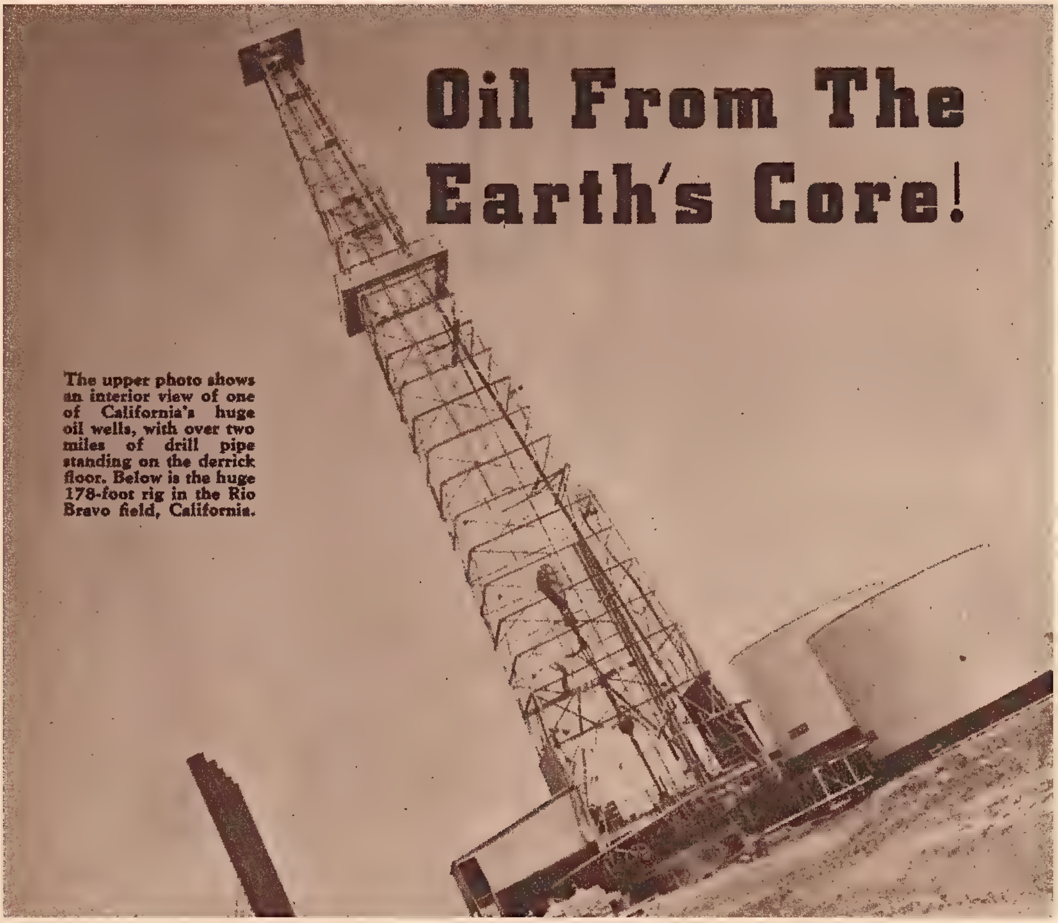
Oil From The Earth's Core!

AMERICA'S vast defense program is swinging into high!

Planes, tanks, armored cars and truck transports are rolling off assembly lines; submarines, destroyers, cruisers and dreadnaughts are sliding down shipyard ways into the water; arms factories are working on 24-hour shifts to supply the rifles, cannons, machine guns and mortars to arm our nation's manpower.

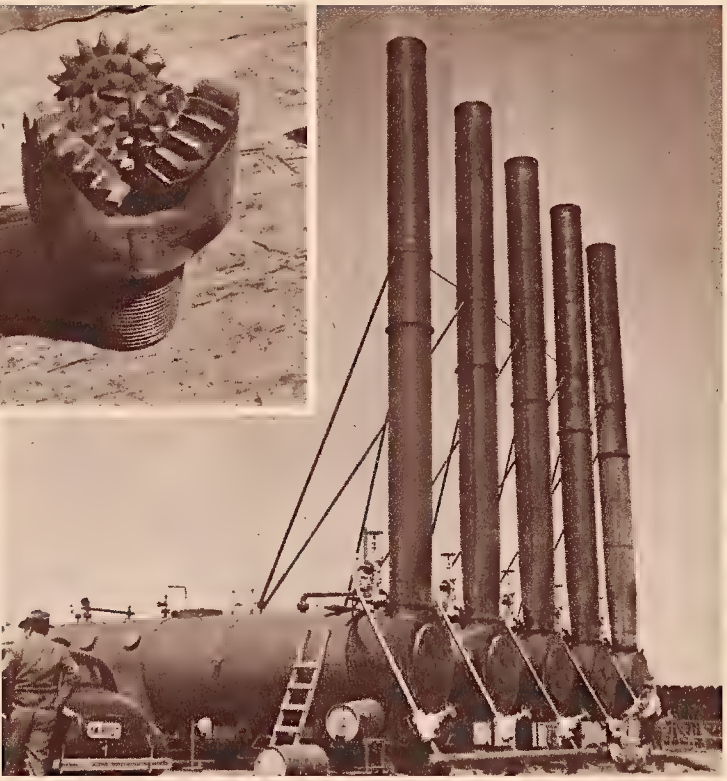
For all these things there is one essential operating ingredient—oil! Oil to power the great diesels; oil to lubricate the guns; oil to furnish the gas to run the planes and motors.

We have oil, yes. The American Petroleum Institute estimates nearly 18,500,000,000 barrels of oil are in reserve through known fields in eighteen states. But we're going to need more. Experts estimate that in the event of war the navy's requirements alone would jump from 9,000,000 barrels of fuel oil, produced from 36,000,000 barrels of crude, to the staggering figure of 50,000,000 barrels of fuel

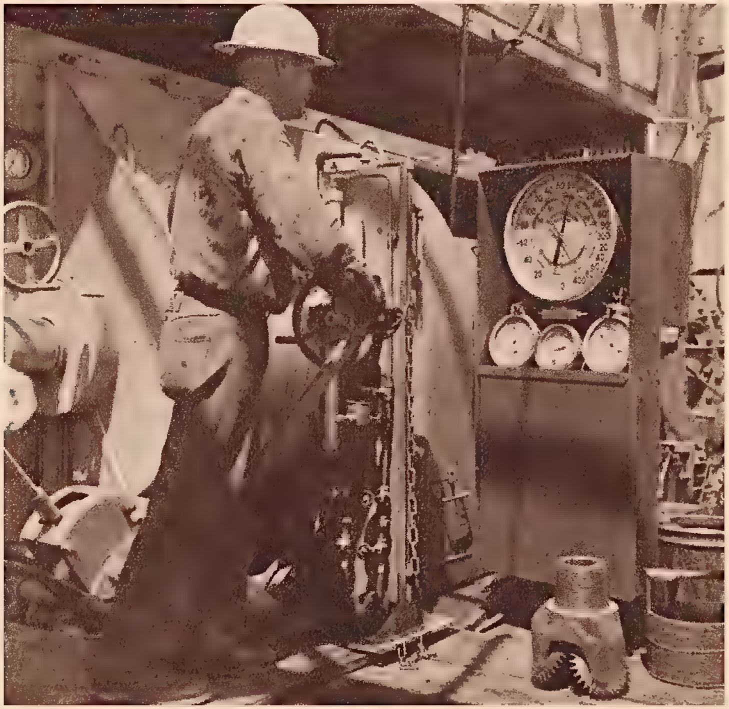


The upper photo shows an interior view of one of California's huge oil wells, with over two miles of drill pipe standing on the derrick floor. Below is the huge 178-foot rig in the Rio Bravo field, California.

Above are rock bits, revolving grinders that are used when the going gets tough for the drill.



Above: Five 130-horsepower boilers operating under pressure of 500 pounds per square inch supply power to turn the drill. Below: By keeping watch of these dials, the driller can tell exactly what is happening to the drill end, far below the surface of the earth.



taken from 200,000,000 barrels of crude!

Brother, that's oil!

And it's why there are now nearly 4,500 drilling rigs in operation seeking new supplies. It's why more than 25,000 wells or more will be completed this year. It's why men in Texas, Oklahoma and California are drilling down, through the Miocene and Eocene sands, boring farther toward the earth's core than man has ever before gone, in an endless search for the new fields of liquid "black gold" so vital to our needs.

Rearing its crown block 178 feet above the floor of San Joaquin valley, not far from Bakersfield, California, the world's tallest oil rig spins its drill at 750 revolutions a minute in search for oil. Powered by steam generated in five 130 h. p. boilers, the bit of the drill can make more than 650 feet a day. So powerful is the machinery, this rig is capable of reaching a depth of 17,500 feet, nearly a half-mile deeper than the deepest drilling ever made before. Because of this

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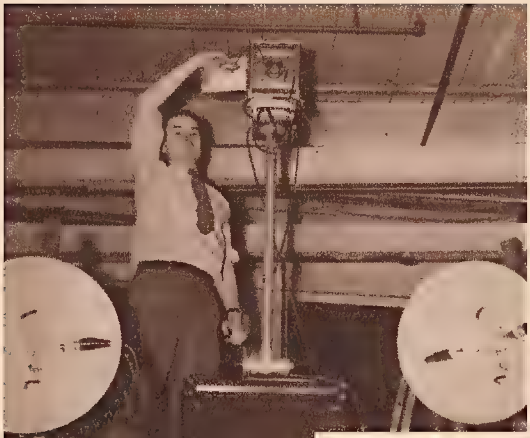
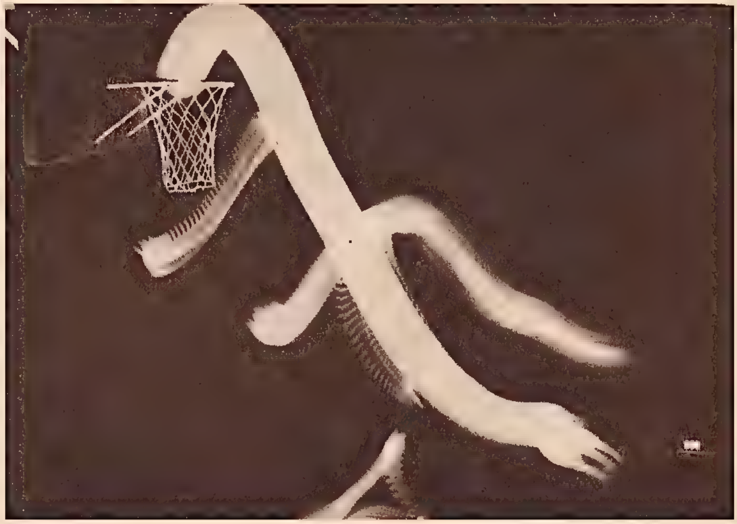
Snapshots of Court Shots!

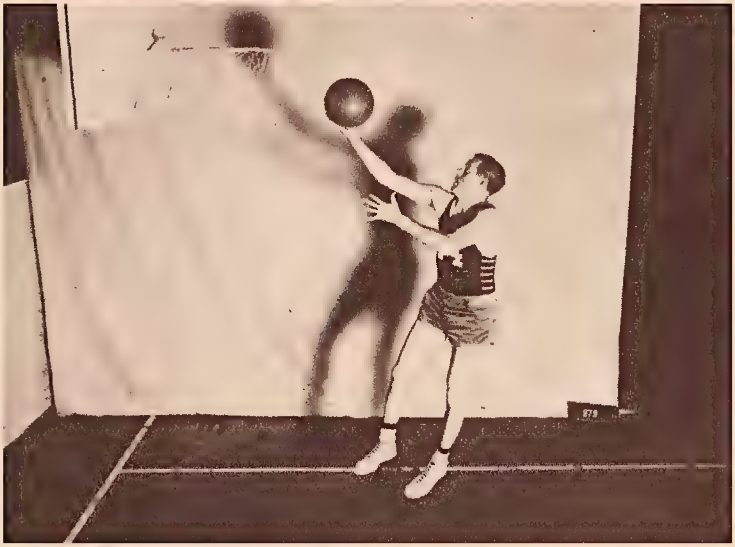


At the left, George Temple, Spalding high-speed photographic technician, is shown ready to snap Nat Holman shooting a basket in the Spalding Research Laboratory.

Below is the striking picture that results when the complete action of a shot into the basket is frozen on one photographic plate. This picture was taken at 100 exposures per second!



The picture below shows Nat Holman, the world's most famous basketball authority, caught with a single flash at 1/30,000 of a second just as he jumps from the floor and tosses for the basket.



WHEN the spectator sees a basketball player charge down the court and shoot a basket, the terrific speed which the player uses prohibits following the play, and the beautiful form and grace of motion is lost to the fans. Even basketball coaches, in trying to instruct their players on form, are at a loss because of the fast action of the game.

In order to give both fans and coaches alike a better insight into what takes place when a basket is made, George Temple, Spalding high-speed photographic technician, at the A. G. Spalding Research Laboratory, Chicopee, Mass., picked the world's leading exponent of the court game, Nat Holman, to show the superb form which made him famous as a basketball player and coach throughout the country. Nat Holman is C.C.N.Y. coach, and president of the National Association of Basketball Coaches.

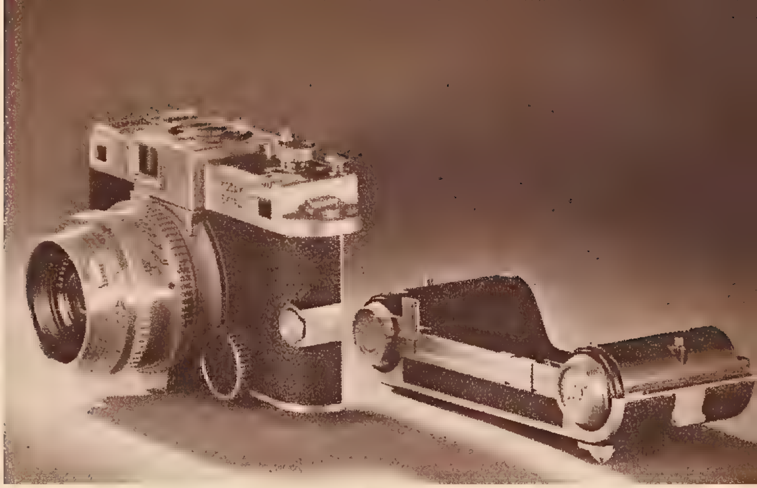
[*Continued on page* 142]

Miniature Super Camera Introduced

THIS new super camera has recently been introduced to the miniature camera field by the Eastman Kodak Company of Rochester, N. Y. The camera embodies the features found on cameras one time available only by importation. Film is contained in interchangeable magazine backs, lenses are interchangeable, and a variable power view finder accommodates both normal and long focus lenses. The range finder is said to be the most precise design found in any miniature camera. Another feature is the focal plane shutter. There are also individual adjustments for the user's vision.

When the camera back is being removed, a metal slide comes into place to cover the film aperture. Until the magazine back is made light-tight in this manner, it is impossible to remove it from the camera. The camera, known as the Ektra, is shown here equipped with a 50mm. f/1.9 lens.

Effort has been made to incorporate in this camera all of the proven features found to be suitable for 35mm. equipment.

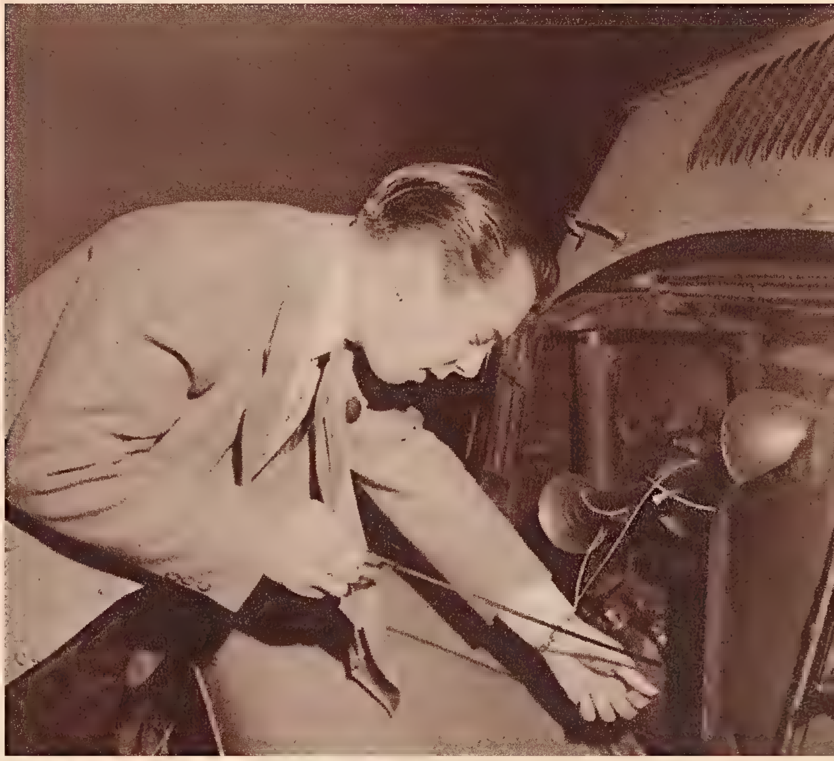


X-ray Detector Worn On Wrist

AS A safeguard to scientists doing X-ray work in General Electric's laboratories at Schenectady, N. Y., its men are equipped with what is known as an X-ray safety "wristwatch." This is a leather case worn on the wrist into which a small piece of unexposed X-ray film is placed. This is carried all day and when developed will show any scattered X-ray by black spots on the film. This acts as a warning.

How To Buy

Don't get stung on a used car! This article tells the simple tests you can make to detect a lemon!



Examine the oil on the measuring rod. If it is unusually heavy it has probably been used to hide motor knocks. Drain it and replace with a normal grade of oil.

Run the car on to a lift to examine the under parts. If the muffler has a piece of tin wired around it, replacement will undoubtedly be necessary.

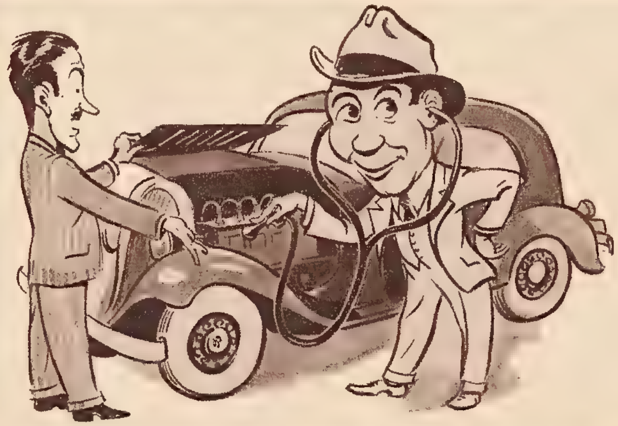
TEN million motorists have never owned a new car. Those who bought their "second-hands" without knowing a few practical rules generally had to shell out hard-earned cash for repairs or replacements.

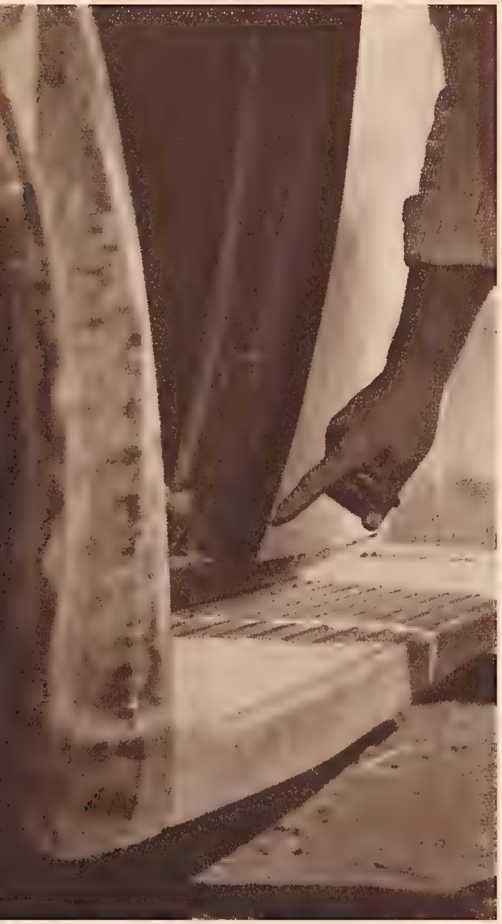
Although the majority of used car dealers are fundamentally honest, the used car market is essentially a "let the buyer beware" proposition. The careless buyer often falls heir to a car that has had the cream of its performance value removed, leaving a burden of worn tires, bearings, slipping clutches, and defects ad infinitum.

A wise thing to do is to

A Used Car

by Rory O'Shane





Note that the lower corner of the door shown above has been sprung out of line—by a crash, perhaps.

Check battery with a hydrometer. Heavily charged, it may have a dead cell.

Collision necessitated this radiator replacement. Numerous new parts may tell tale.

steer clear of slick looking paint jobs. Though logically a carefully protected interior should denote the same condition for the rest of the car, a new paint job in this situation is a camouflage for abnormal wear, tear, and abuse.

In the interest of safety it is important not to buy a rebuilt "wreck." The car may have regained its original contours and finish, but hidden structural weaknesses are apt to appear at dangerous moments. No amount of ingenious body work can restore strained motors and frames to their initial strength.

Putting your finger on a rebuilt "wreck" is not difficult. Replaced radiators, fenders, bumpers, and running boards are the danger signals. Doors that sag, or open and close with difficulty indicate that the frame has been sprung. Some mechanics raise the hood and examine the braces that run from the top of the radiator to the back of the motor. The force necessary to bend or twist these is evidence that the car has been in a severe collision if bends are present.

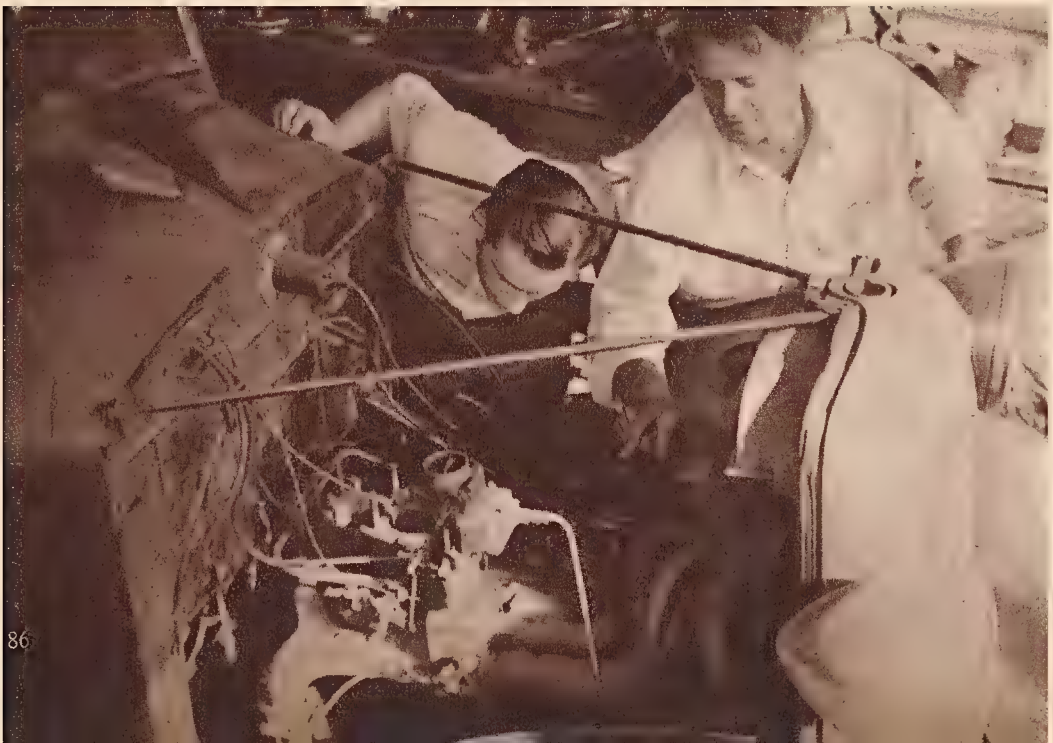
The best procedure is to run the car on a hoist and examine the frame. Nothing the dealer can do will hide weld marks underneath the car. Bluish patches on the frame are signs of a heat straightening process. Where the frame has been cold straightened, you can see the marks of the press.

While the car is elevated, you might take a glance at the muffler. Wrapping a sheet of tin around a broken muffler is an old trick, but quite effective.

The life of a tire is roughly 30,000 miles. Therefore if the tires are fairly new but of different makes, you can safely estimate a car mileage figure of over 30,000 miles. Another reason for the different brands may be that the former owner was too hard on the original tires. If so, he probably

Uneven front tire wear is evidence of bad alignment or worn steering mechanism.

Removal of the cylinder head may reveal presence of graphite and paraffin compound.



was hard on the motor also.

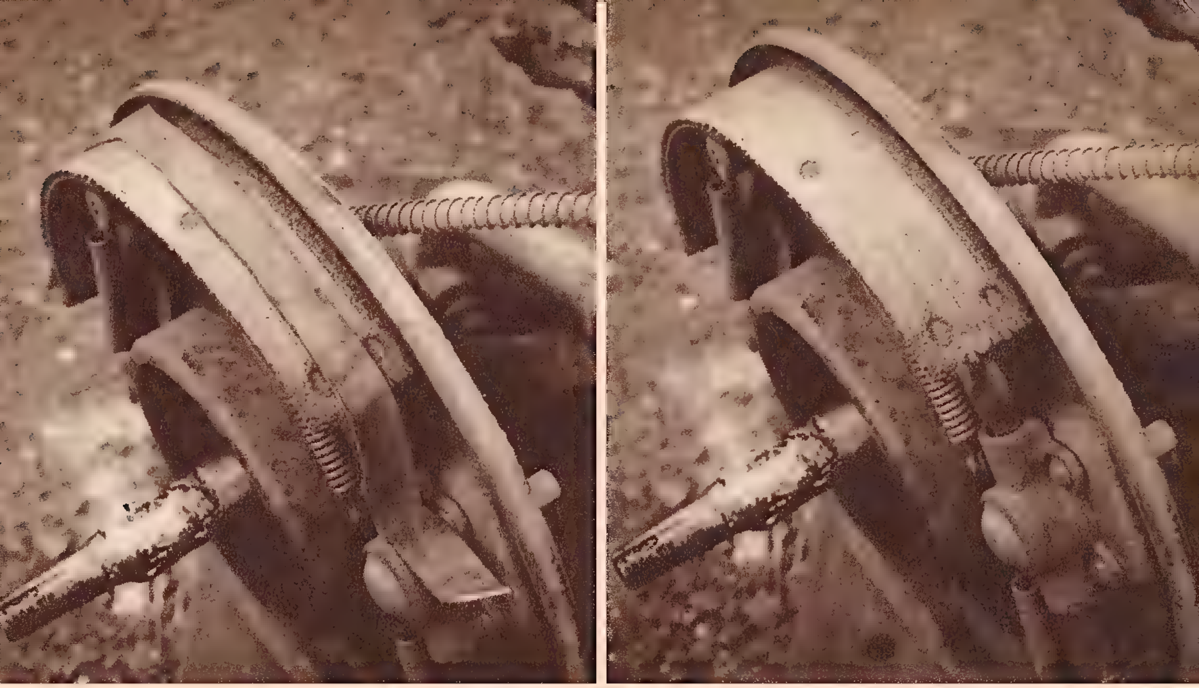
The fact that the tires look brand new is not conclusive proof that they are. Retreading or recapping processes cut beautifully new grooves into bald or worn tires and are inexpensive for the dealer. But such tires are dangerous at high speeds and will have to be replaced shortly.

You can spot a retread by looking for the faint impressions of the original tread, or by the fact that the new grooves do not extend clear to the outer ridges of the tire. Recapped bald tires are distinguishable by their extremely thin treads.

If the front wheel tires have treads worn more on one side than the other, the trouble may be incorrect wheel alignment, broken springs, or a bent tie-rod.

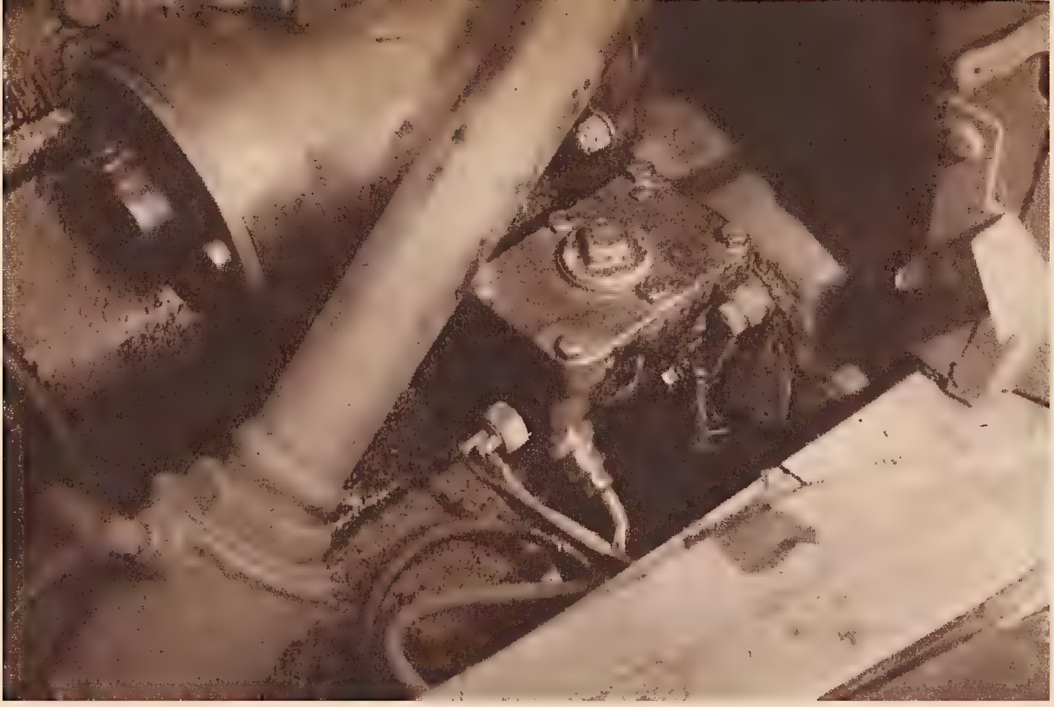
Shake the wheels from side to side. If they wobble noticeably, they need a rebushing job. Worn out bushings will also cause the front wheels to "shimmy." Unscrupulous dealers may rectify this condition by pouring sand into the bushings and king-pins, so have a front wheel removed and look at the bushings for traces of sand. Before turning on the ignition, step on the starter button and keep it going for about ten seconds. This is long enough to hear the b-r-r of broken starter teeth.

Use a hydrometer to check the battery. Quite often the dealer will put a highly charged battery with one dead cell in the car to save himself a few dollars. His idea is



Above Left: A brake band whose action has been faked with strip of inner tube.
Above Right: A brake band that has been worn down to the brass rivet heads.

This differential has been made to run quietly with sawdust in grease.



Notice the wet tubing close to the fittings on this hydraulic brake mechanism. A big repair job.

that you buy the new battery after using the car about a week.

A quiet sounding motor may not mean a thing. Heavy tractor oil will deaden all rod and bearing knocks. Look at the oil on the plunger stick. If it is unduly thick, ask to have it drained and oil from sealed tins put in. Then listen to the motor.

Probably the slickest device is pouring a compound of graphite and paraffin through the spark plug holes. This spreads around the pistons and hardens into a padding which silences piston knocks and gives increased compression for awhile. The mixture, however, has been known to cake into a substance so hard it had to be chiseled from the cylinder walls.

Removing the engine head is the only way this can be detected. If you can't do this yourself, bring a mechanic. A dealer who will refuse to have this done even under his supervision has ulterior motives. Best look elsewhere for your car.

Because of the widespread disregard of the laws against tampering with speedometer readings, the amount registered on the car will have no significance. To get an approximate idea of the mileage, multiply the age of the car by 10,000, which is the mileage per year of the average motorist.

The condition of the upholstery has tales to tell. If the previous owner was careful of it, he probably was easy on the car in general. A back seat showing signs of wear such as are made by salesmen's sample cases is a "steer clear" signal. A car used by a traveling salesman is invariably "shot" beyond hope.

The road test is still an

[*Continued on page* 143]

He's getting his written guaranty and his bill of sale before he takes the car home.

MECHANIX ILLUSTRATED PHOTOGRAPHY SECTION

PAGES 89-94

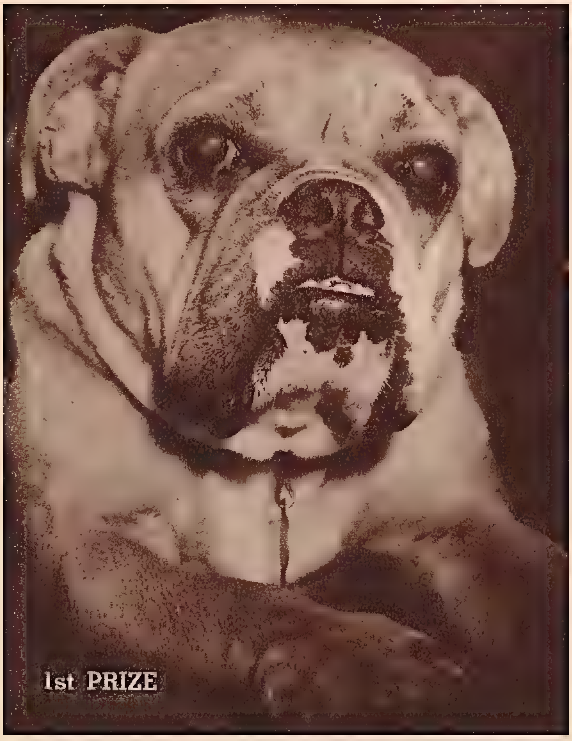
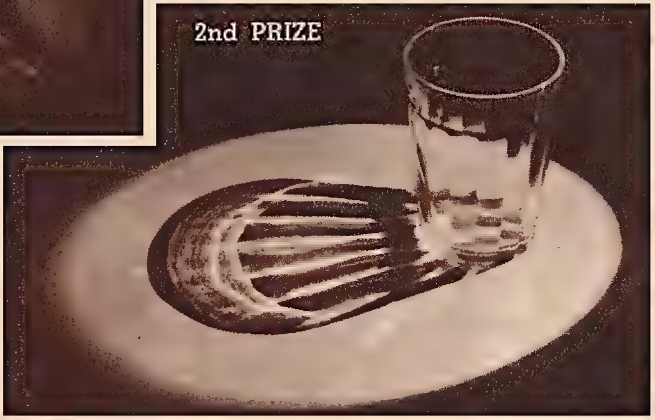
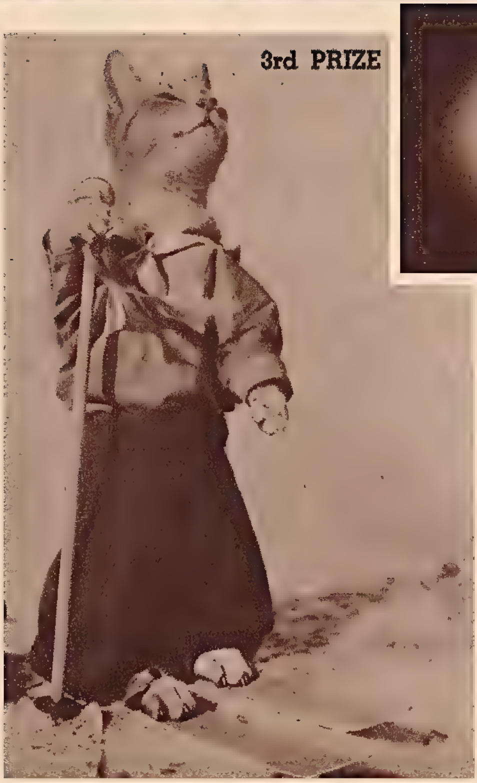


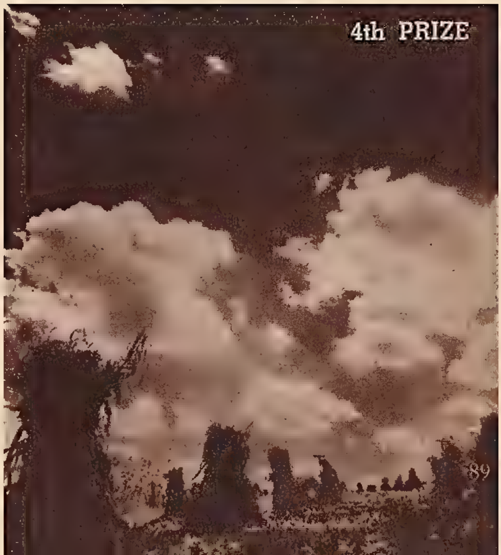
PHOTO CONTEST

FIRST PRIZE ($10.00): "Honorable Maud" by Vincent S. Barker, 4714 261st Street, Great Neck, L. I., N. Y., flashed with 4x5 Speed Graphic on Agfa Isopan developed in Agfa 17. SECOND PRIZE ($5.00): "Glass Pattern" by Donal Stole, Big Timber, Montana, taken with Kodak Monitor 620 and portrait attachment—4 minute exposure at f/16 by "spot" produced by flashlight. THIRD PRIZE ($4.00): "Dorothea Goes Skiing" by Nancy Hendrickson, Mandan, North Dakota, taken with Ansco Speedex 3A camera—outdoors under cloudy sky. FOURTH PRIZE ($3.00): "Sunrise and the Harvest" by E. J. Eisenmeier, 3700 Frankford Ave., Baltimore, Maryland, exposed on Ilford infra red film with "A" filter and developed in DK-20.

New contest this month. Submit prints unmounted—no larger than 8x10. With each print list your camera, film, lens opening and shutter speed, illumination and developer. Write your full NAME and ADDRESS on each print and wrap securely with corrugated or cardboard stiffeners. If you want unused prints returned, please enclose postage. (Published prints will not be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

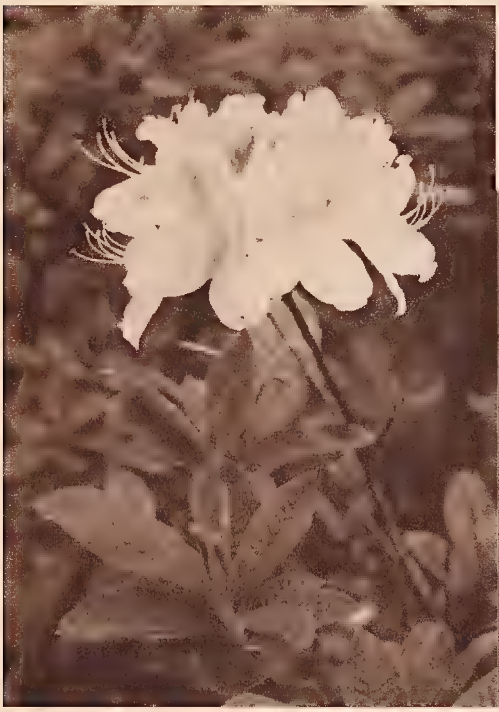






Print "Dodging" in

by
Flora K. Howes



LEFT: Background detail is distracting in this straight, undodged flower "portrait." BELOW: Local printing. The petals receive additional exposure from the light passing through the hole.

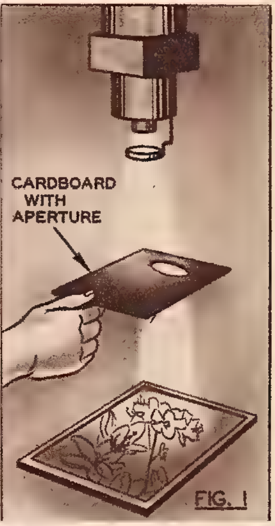
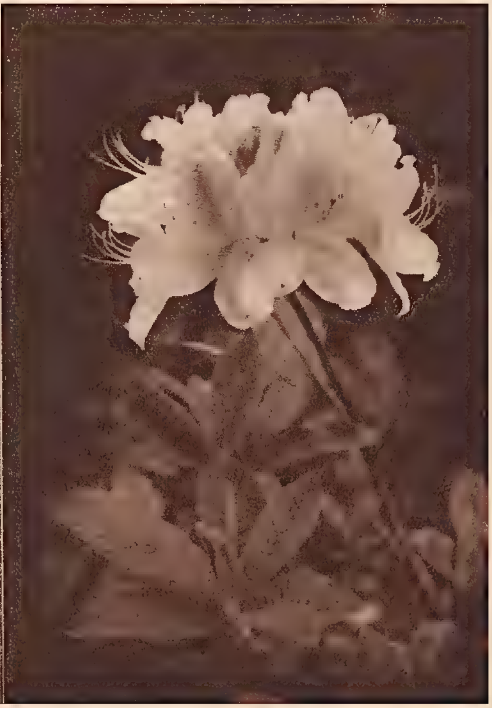


FIG. 1

RIGHT: Dodged print from the same flower "portrait" negative. Note how the petal detail has been accented by local printing. Background detail was dodged in by the method shown below.



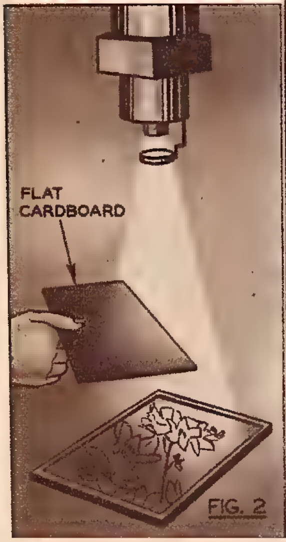


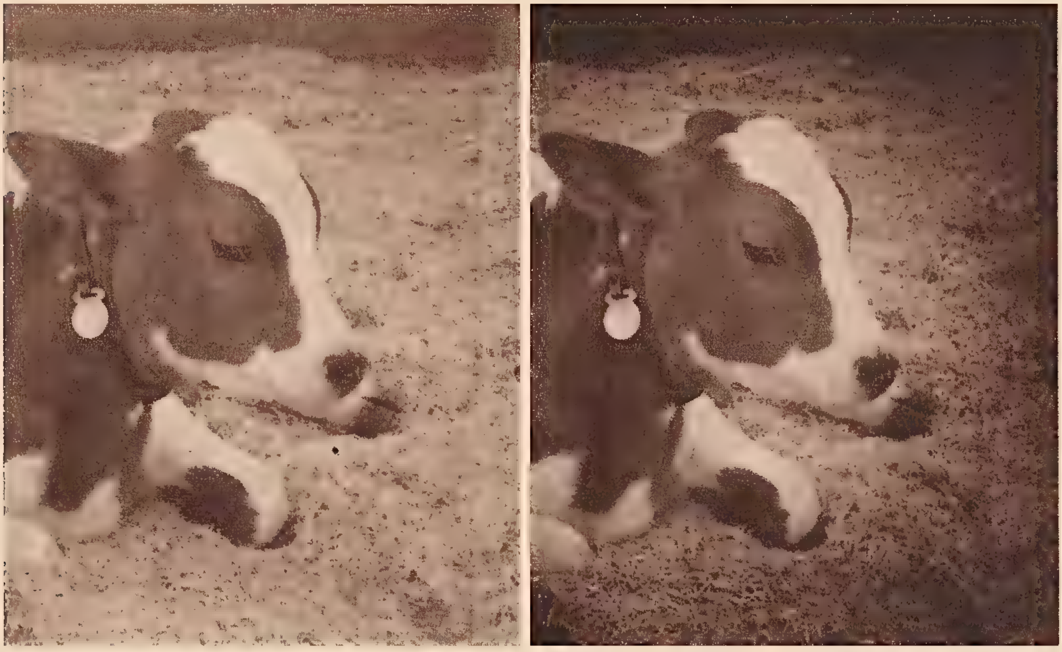
FIG. 2

EVERY amateur photographer has negatives which would make excellent salon enlargements if only something could be done about their light backgrounds and their spotty, distracting foregrounds. Light areas and unwanted details draw the eye away from the principal subject of the picture; they weaken the composition.

The only answer is dodging or local printing, or a combination of both. Many references are made in photographic literature to these two standbys. Just what does each operation involve? What tools are needed? Is it hard or easy?

Dodging and local printing are easy if you are patient. It takes nothing more than a knack to master them. Figure 1 is a rough sketch of the local printing operation. After the print has been normally exposed to the enlarger light, a cardboard with a circular or oval hole or aperture cut in its center is placed between the enlarger lens and the paper. The printing light is

One Easy Lesson



ABOVE LEFT: "Straight" print and, ABOVE RIGHT, dodged print from the same negative. Fig. 3, RIGHT: How the dodging was done. The printing light flows around the cardboard disc, thereby darkening the marginal areas and leaving the head and shoulders of the principal subject as they were in the straight print. Darkening of spotty foreground and background detail accents the main interest—strengthens the composition.

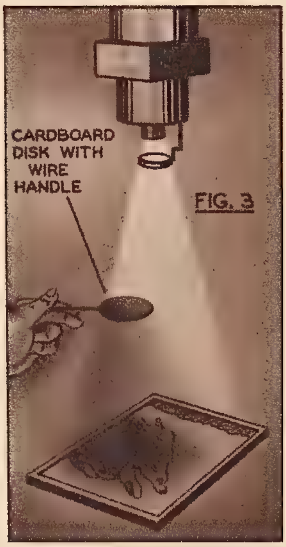


FIG. 3

permitted to pass through the hole in the cardboard to the part of the picture area that needs darkening. There may be one or several such areas. When an area that is to be printed locally is fairly large and at the edge of the picture area a solid cardboard sheet is used as in Figure 2. The portions exposed to the unimpeded printing light are darkened here again.

Figure 3 shows how dodging is done. The position of the cardboard disc between the enlarger lens and the printing paper is controlled by the thin wire handle. The areas over which the disc is held are "held back" while all surrounding areas are darkened.

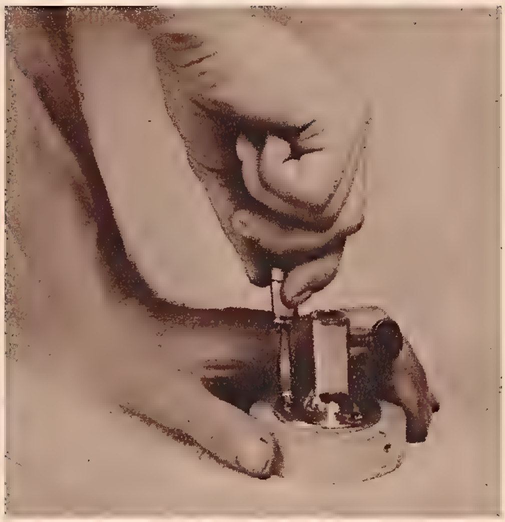
In all three instances the dodging or local printing medium must be kept moving continuously either up and down through a short distance or a little to each side of the area concerned. This prevents the formation of sharp demarcation lines between the areas receiving additional exposure and those that don't. The normal position of the dodging or local printing board is about midway between the lens and the paper easel.

Let's consider a typical example, the case of the rhododendron "portrait." Use of a portrait lens from a close-up camera position threw most of the background detail out of focus. However, light areas from adjoining blossoms nearby continued to distract the eye when the enlargement was made in the usual way, and the petal detail was slightly washed out. On the basis of test strips made for the various

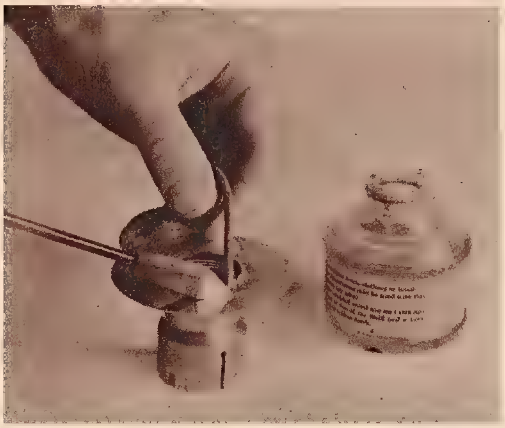
[*Continued on page* 144]

"Darkroom Spot"

Print in hypo solution under the "Darkroom Spot."



Above: Fastening flange to the wooden disc. Below: Soldering the metal "reflector" disc to the bottom of the brass-shell electrical socket (with switch removed).



by Arthur Trauffer

SUSPENDED above the hypo tray, this lamp will enable the photographer to inspect his prints while they are still in the hypo and without any danger of fogging sensitized paper that happens to be lying open in the darkroom. The spot of light produced is confined to the hypo tray and is adjustable for both diameter and intensity. Control is accomplished by changing the position of the bulb within the lamp tube, and by raising or lowering the lamp proper.

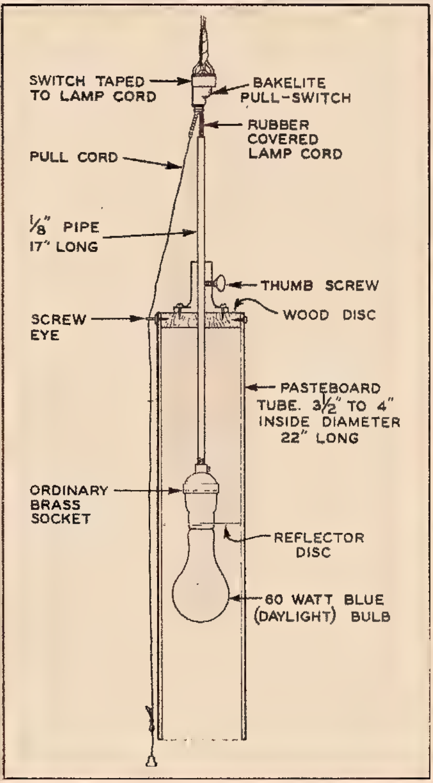
An added feature is the use of a blue (daylight) bulb in the lamp. The spot of "daylight" directed into the hypo tray closely approximates natural daylight. It will give one a reasonably accurate idea of how the prints will look when they are dry and viewed in natural daylight (taking into consideration, of course, the fact that most papers darken up a bit in drying).

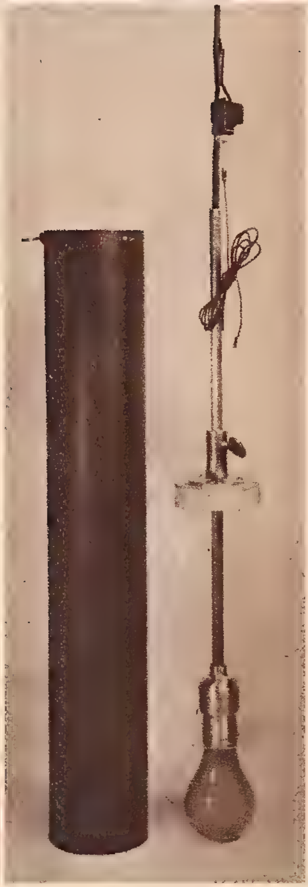
The lamp is turned on and off by means of a pull-chain switch, connected to the drop-cord by which the lamp is suspended. A pull-cord is tied to the chain of this switch and the cord is hung within easy reach of the hypo tray. All parts necessary for the construction of this inspecting-lamp are easy to obtain, and should not amount to more than $1.35 all told. These are:

Pasteboard or cardboard tube, 22 in. long, inside diameter 3½ in. to 4 in.
⅛-in. iron or brass pipe, 17 in. long.
Supply pipe bracket, or flush-pipe bracket (flange only).
¼-in. thumb-screw, 1⅛ in. overall length.
Hardwood 5 by 5 by ¾ in.
Ordinary brass-shell lamp socket (plain, without switch).
22 gauge sheet metal, 5 in. by 5 in. (not aluminum).
Six nickel-plated, round-head wood screws, overall length, ¾ in.
One screw-eye, about 1 in. long.
A 60-watt blue (daylight) bulb.
Small, bakelite pull-chain switch (pigtail type).
Length of rubber-covered drop-cord ("pull-apart" type).

The cardboard tube, which should be about 22 in. long, with a 3½-in. to 4-in. inside diameter, is painted inside with flat black paint to kill undesired reflections. The tube will then throw a fairly sharp spot of light. The outside of the tube is also painted flat black, and when dry, is given a coat of shellac or varnish to make it moisture-proof.

For Print Inspection


SWITCH TAPED TO LAMP CORD
BAKELITE PULL-SWITCH
RUBBER COVERED LAMP CORD
PULL CORD
⅛" PIPE 17" LONG
THUMB SCREW
SCREW EYE
WOOD DISC
PASTEBOARD TUBE. 3½" TO 4" INSIDE DIAMETER 22" LONG
ORDINARY BRASS SOCKET
REFLECTOR DISC
60 WATT BLUE (DAYLIGHT) BULB



Essential parts of the device, both assembled and disassembled are shown here. The diagram gives most of the necessary construction details. Illustration to the right is a view of the completed inspection "spot" with the tube removed.

From a piece of ¾-in. hardwood stock, jigsaw a disc that will fit snugly into one end of the tube. Bore a ⅜-in. diameter hole through the exact center of this wooden disc. The disc can be stained and varnished to moisture-proof it.

Obtain the wall-flange part of a supply-pipe or flush-pipe bracket. This is a standard piece of sanitary plumbing equipment and can be obtained from a plumber or plumbing supply house. (The writer bought his for 20 cents.) This flange comes threaded for a ⅜-in. bracket, making it necessary to enlarge the opening a trifle with a rat tail file, so that a standard ⅛-in. pipe will pass through the flange snugly. Now bore a $\frac{3}{16}$-in. hole in the nipple of the flange and thread this hole with a ¼-in. by 20 USS tap; this is for the ¼-in. thumb-screw.

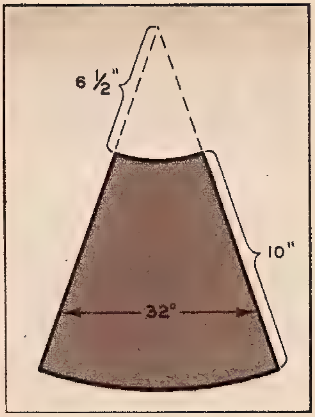
Now fasten the flange and the wooden disc together with three, round-head wood screws about ¾-in. long. Be sure that the holes are in line before fastening them together.

Thread one end of a 17-in. length of standard, ⅛-in. pipe with a ⅛-in., 27 NPT die. This thread fits the threaded nipple on the cap of an ordinary, brass-shell lamp socket. Screw the cap of the socket onto the pipe and tighten the set-screw.

The metal disc which is mounted onto the socket not only acts as a reflector, but also keeps the bulb centered within the cardboard tube. This disc, which is cut from 22-gauge sheet metal, should be ⅛-in. smaller in diameter than the inside diameter of the cardboard tube. An opening, which is equal to the outside diameter of the socket, is cut out of the

[Continued on page 144]

Helpful Picture Making Aids

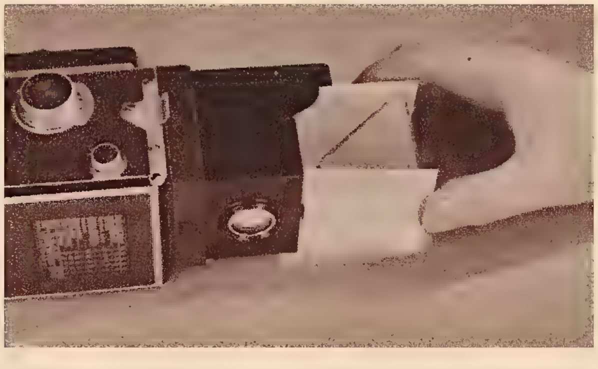


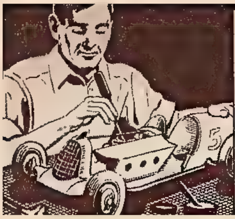
ABOVE: This folding hood extension makes reflex camera focusing easier by cutting down overhead sky reflections; it permits photographers to view focusing screen comfortably at 9 inches. Hood is made of tire inner-tubing 9½" long; upper opening 1" in diameter, lower 2½". Sketch shows paper pattern from which tubing is cut. Overlap of the tubing is ¼".—*Robert Scott.*

BELOW: "Desk Lamp Safelite." An ordinary goose-neck desk lamp can be converted into a flexible safelight for the darkroom by fastening an amber "fog light" over the lamp shade. Made of amber-colored flexible material, "fog light" covers are available at auto supply stores; the elastic in the seam makes them easy to slip over the shade. Used with a 7½-watt frosted bulb, the unit is suitable for contact printing. For bromide paper printing, fasten a few sheets of red cellophane over the "fog light" with a rubber band.—*Robert Scott.*

ABOVE: Use an old camera back to hold film when enlarging positive transparencies from small negatives, or black and white negatives from small Kodachrome transparencies. Rip away the camera bellows and bed; load film on camera's spools and advance by turning the key.—*Louis Hochman.*

BELOW: A mirror placed next to the hood of a twin lens reflex as illustrated permits pictures to be taken in a horizontal position. This is necessary when such cameras, whose ordinary film format is square, are used with Kodachrome reducing adapters. Two strips of cardboard are first cut to fit inside the viewing hood; then cement a square piece of mirror between them adjusted at 45 degrees to the viewing screen. This makes it possible for the screen to be observed from above when the camera is held horizontally at waist level.—*Kenneth Murray.*





How to Build SECTION

IN THIS ISSUE

The projects shown on this page are but a few of the many interesting workshop jobs in this issue. Such proven designs as these are pleasing to make and use.

The attractive household accessory shown below is a match pack magazine. See plans on page 128.

A little wood and some old wallpaper are all you need to make this correspondence case. Page 126.

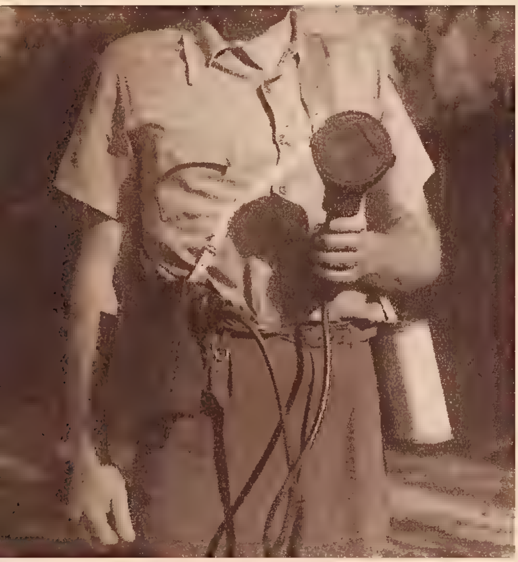
Radio fans will like this fine all-wave receiver. See plans and instructions on page 100.

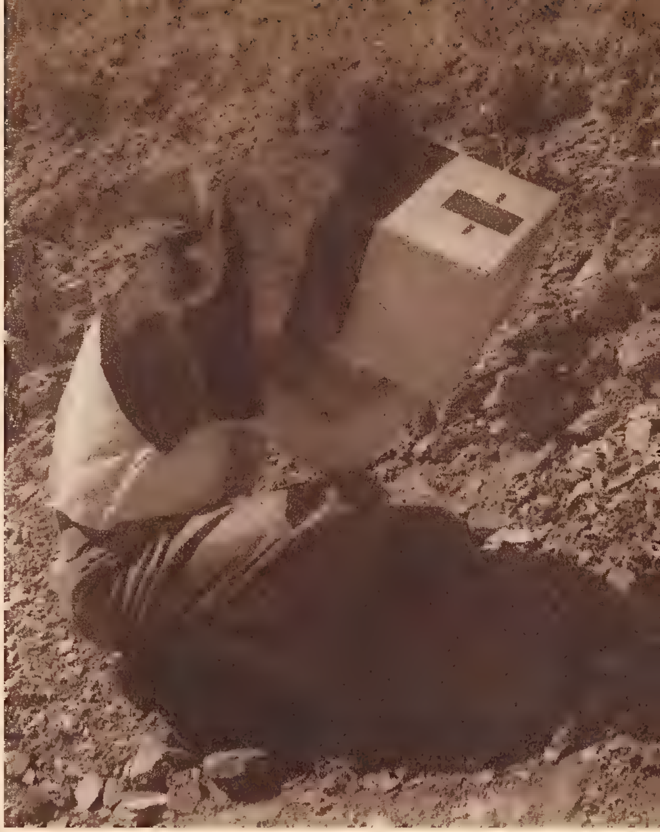
The useful and decorative boxes shown above are made from wood blocks. Complete plans and data on page 105.

A sturdy trailer that can be used for camping or hauling. It is easily built from plans and instructions on page 106.

Prospecting

Discover beautiful fluorescent minerals at night with a homemade black light outfit!





Below: Portable battery, transformer and mercury-vapor lamp make up this light, powerful torch for night prospecting. Right: Daylight viewing box utilizing filter glass over window in top of carton. Specimens are examined by the sun's ultraviolet.

This bearded and tattooed western desert prospector examines a find under the almost invisible beam of a black light torch made from a 5-cell flashlight and a disk of filter glass.

FLASH your ultraviolet torch on a pile of rocks and see minerals gleam as if outlined in fire!

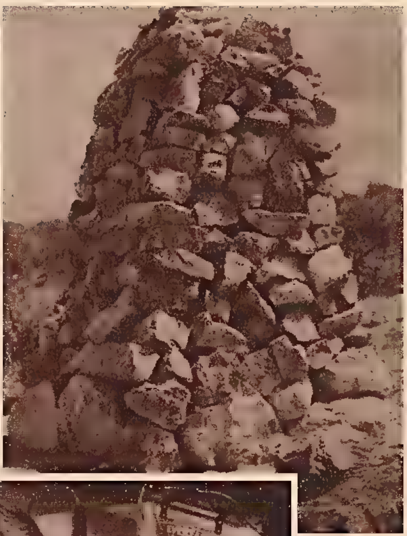
Night prospecting is as simple as that. Any of the 300-odd "fluorescent" minerals—including some commercial ores such as tungsten and zinc—can be detected by their brilliant glow under the dim purple ray from a mercury lamp. Many of them will respond to the weaker light from a simple homemade outfit costing as little as two dollars.

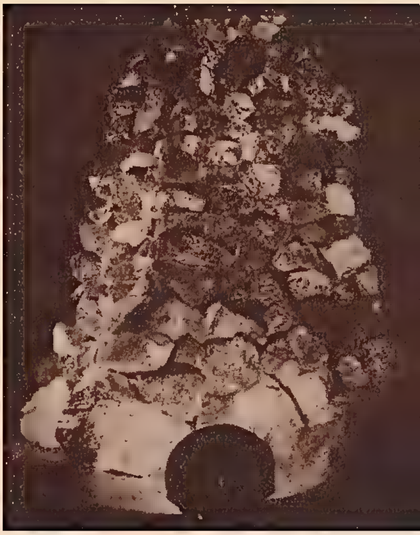
Luckily for the amateur prospector, these minerals are scattered widely throughout the United States. Every rock pile, every gravel bank or quarry, is a prospecting ground. A collection of these strange minerals, mounted in a dark cabinet and lighted by the dim

With Black Light

by
Sterling Gleason

Right: Day and night views of claim monument at a tungsten mine in California. Night view was made by the glow of the tungsten ore under an ultraviolet lamp.

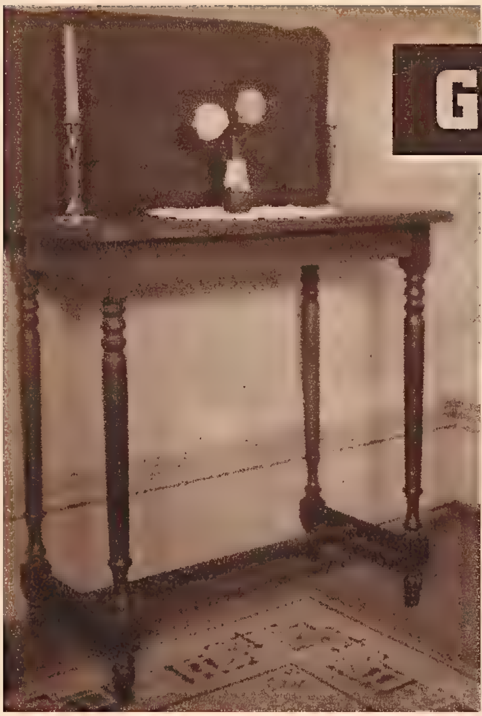




glow of an ultraviolet torch, makes a spectacular exhibit. Visitors gasp when the dull, drab-rocks suddenly flame many colors, intense and beautiful, as if from fires within. Some of these minerals also are phosphorescent. They can be "charged" with light by holding the torch close to

[*Continued on page* 116]

Rock specimens may be viewed in daylight by putting them into a drawer in this cabinet, shoving it under ultraviolet torch which plugs into the top, and looking down through the peephole. Such equipment is very useful in field work either by day or by night.



Graceful Console

This is a piece of furniture that anyone would be proud to own. You can build it easily with regular shop tools and a wood turning lathe.

Left: This is how the finished table will look in your living room. Below: After sanding the legs, polish them while still in the lathe.

Left: The stretcher, or cross rung is doweled in place. Clamps hold parts.

Right: Fastening legs in place with lag screws. Bottom is plywood.

Right: Screwing the arm in place. This holds the rear top panel vertically rigid.

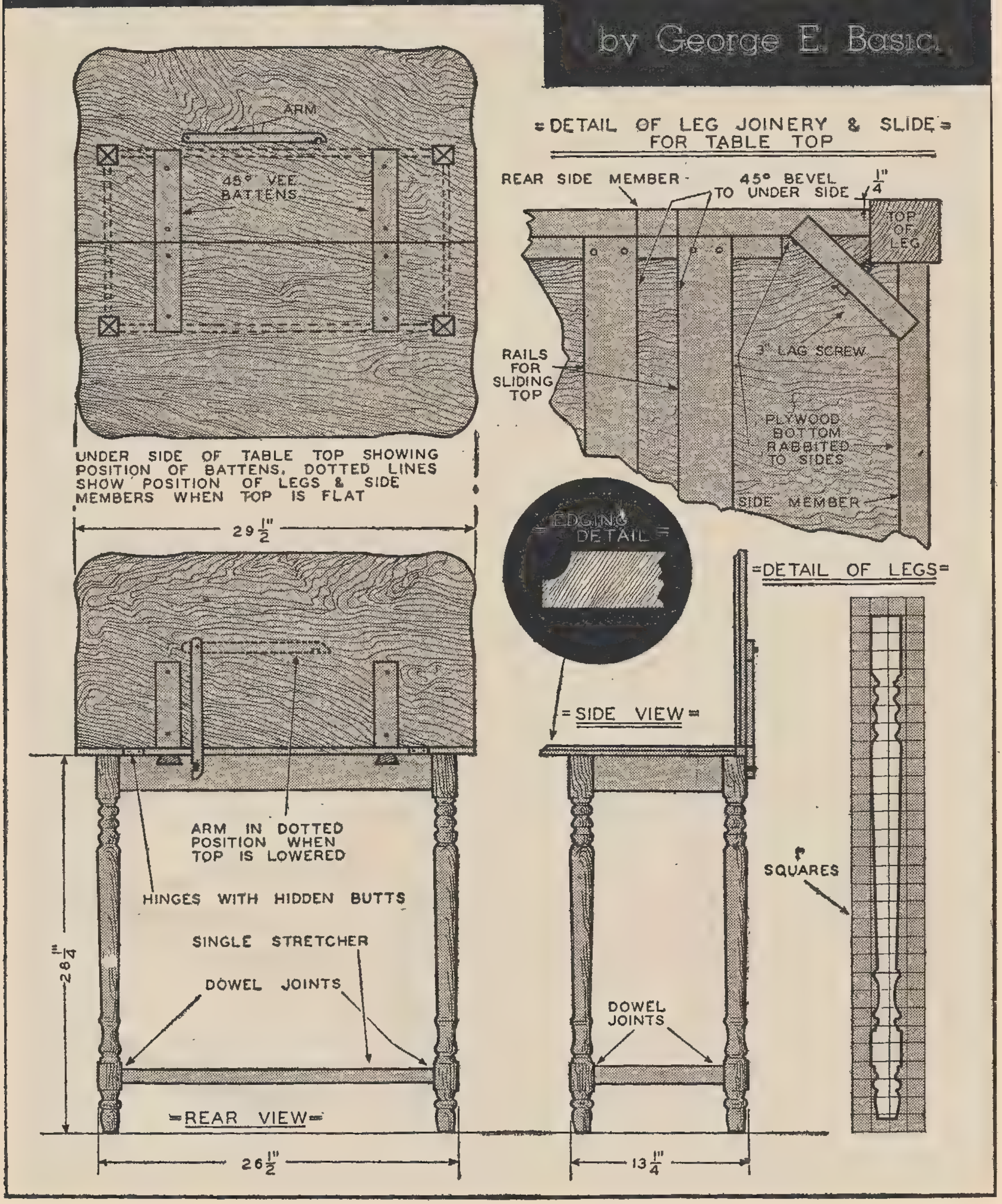
Below: The sides of the table must be well finished to have a beautiful appearance

TURNING the graceful legs of this console table will test your skill as a craftsman, but even the novice will be pleasantly surprised at his handiwork if he exercises caution as he goes along. The table, of beautifully grained red gum wood, designed in the modern mode, features a split top which normally folds up against the wall but which can lie flat thus forming a table large enough to seat four for cards or tea.

The legs are turned from 1⅝" square gum

Table Is Easy To Make

by George E. Basic


ARM
45° VEE BATTENS
UNDER SIDE OF TABLE TOP SHOWING POSITION OF BATTENS. DOTTED LINES SHOW POSITION OF LEGS & SIDE MEMBERS WHEN TOP IS FLAT
29 1/2"
=DETAIL OF LEG JOINERY & SLIDE FOR TABLE TOP=
REAR SIDE MEMBER
45° BEVEL TO UNDER SIDE
1/4"
TOP OF LEG
RAILS FOR SLIDING TOP
3" LAG SCREW
PLYWOOD BOTTOM RABBITED TO SIDES
SIDE MEMBER
EDGING DETAIL
=DETAIL OF LEGS=
=SIDE VIEW=
SQUARES
ARM IN DOTTED POSITION WHEN TOP IS LOWERED
HINGES WITH HIDDEN BUTTS
SINGLE STRETCHER
DOWEL JOINTS
28 1/4"
=REAR VIEW=
26 1/2"
DOWEL JOINTS
13 1/4"

Above: These are the detailed plans of the table. Follow the squared drawing for lathe work on the legs.

wood 28¼″ long. After they have been finished and sanded, stain and varnish them in the lathe and care must be used thereafter in handling them in the workroom. The side members are 3″ wide, as shown, and are assembled with screws. The bottom of these are rabbeted to take ¼″ plywood which forms a small compartment beneath the table top and which adds extra strength to the table

[*Continued on page* 145]

"ALL-WAVE ELEVEN"

An advanced communications-type receiver embodying every modern feature of the refined superheterodyne circuit. A project for the experienced radio constructor who wants to enjoy superlative results.

(This is the first of two articles describing this set. The second will appear in the April issue.)

by Howard G. McEntee

THE "All-Wave Eleven" receiver may seem to be quite a large job to tackle, and so it is. But it is offered as a radio set which can be built at home with the least possible interference from "bugs" and one which is modern and up to the minute in every respect.

The outfit is built along the lines of a commercial communications receiver and has the same general tube lineup. The tubes are used as follows (see diagram opposite): V1, r.f. stage; V2, mixer; V3, high-frequency oscillator; V4, voltage regulator; V5, first i.f. amplifier; V6, second i.f. amplifier; V7, detector; V8, noise silencer; V9, first audio amplifier and beat oscillator; V10, audio power amplifier; V11, rectifier.

Since band spread is of prime importance in such a set, great care was taken in the selection of the tuning controls. The band spread is accomplished by the parallel condenser system, wherein one condenser gang of large capacitance acts as the so-called "tank" and is set to the vicinity of the frequency desired, then actual coverage is obtained by means of the small parallel condenser gang. Both sets of condensers are combined in one frame, resulting in a compact and efficient unit.

Two dials are required. The band-set dial is a friction drive 4 to 1 unit which is also used for the main tuning control on the lower frequency bands. The band-spread dial is an exceptionally smooth 10 to 1 ratio unit of the type used on many communication receivers, and is absolutely without backlash in operation.

As mentioned above, the general coverage dial is used almost exclusively for tuning on the lower bands, as the band spread dial does not cover a wide enough band of frequencies to make it usable. The latter is always available as a vernier, however.

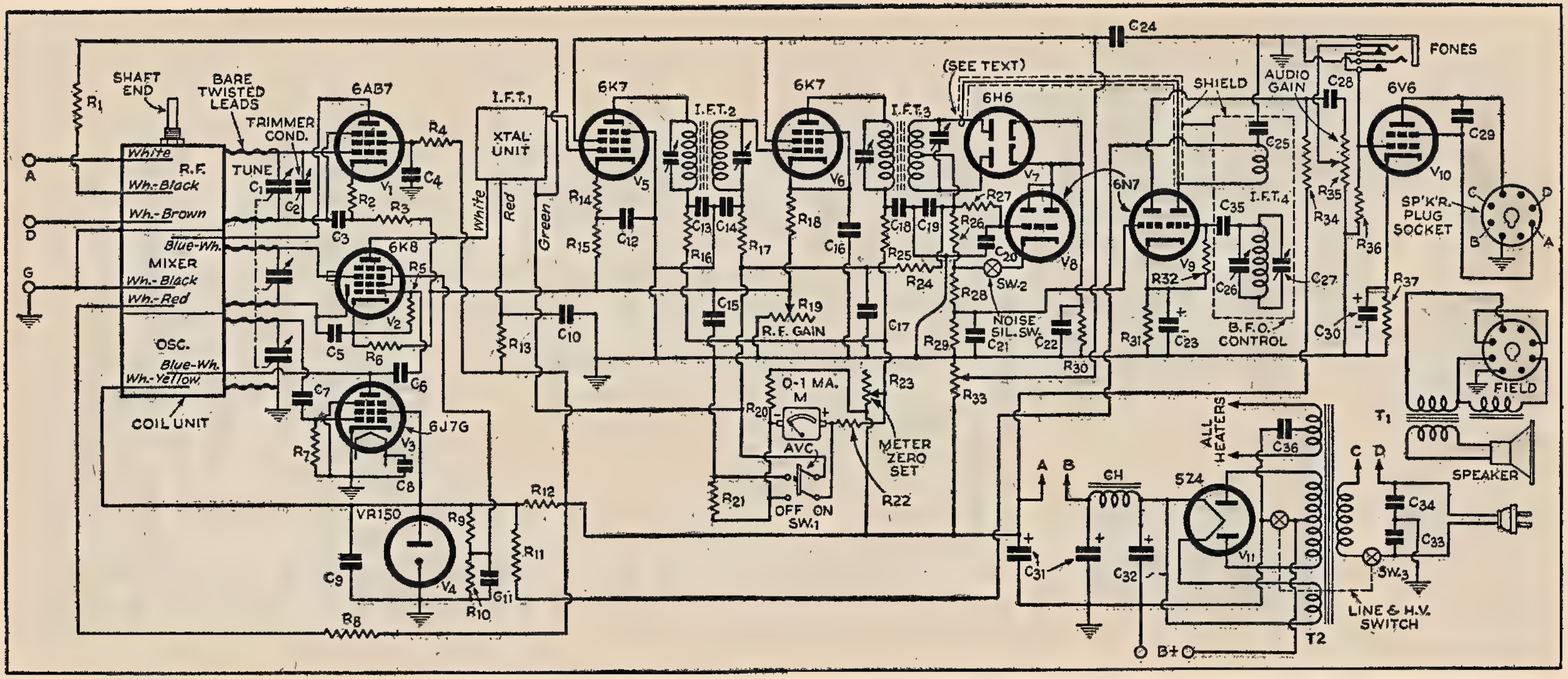
An extra control in the form of a trimmer condenser C2, across the first section of the main tuning condenser, C1, has been installed. This trimmer serves to compensate for various different types of antennas, and allows the r.f. stage to be kept in exact resonance, thereby affording higher gain and a better image ratio.

The coil set comes all wired and assembled and covers a range from 530 kc. to 32 mc. in five ranges, selected by a built-in switch. The use of such a commercially available coil set is of the greatest help to the less experienced builder, and even to the expert it is a great saver of time and trouble. This coil set must be altered slightly as will be described later in order to fit under the chassis.

Following the high frequency section comes the crystal filter unit and here again a completely assembled and factory-wired unit is employed. This particular crystal circuit is exceptionally efficient and is designed for peak performance on both phone and c.w. signals. It has two panel controls, selectivity and phasing; the former is a six-position switch. When properly aligned in the circuit there is absolutely no difference in strength of an incoming signal between the No. 1, or OFF position, and No. 2 or No. 3, and very little drop in signal strength is noted even in the extreme selective position. Its ability to eliminate heterodyne interference is remarkable.

Two conventional i.f. stages follow, with iron-core, air-tuned transformers throughout. The full-wave second detector, V7, and associated noise silencer, V8, come next. V7 provides a.v.c. voltage for the r.f. and i.f. tubes, a.v.c. being controlled by SW1. This same switch also shorts the tuning meter when in the OFF position. In this condition the r.f. gain control, R19, is used to prevent circuit overload on strong signal input.

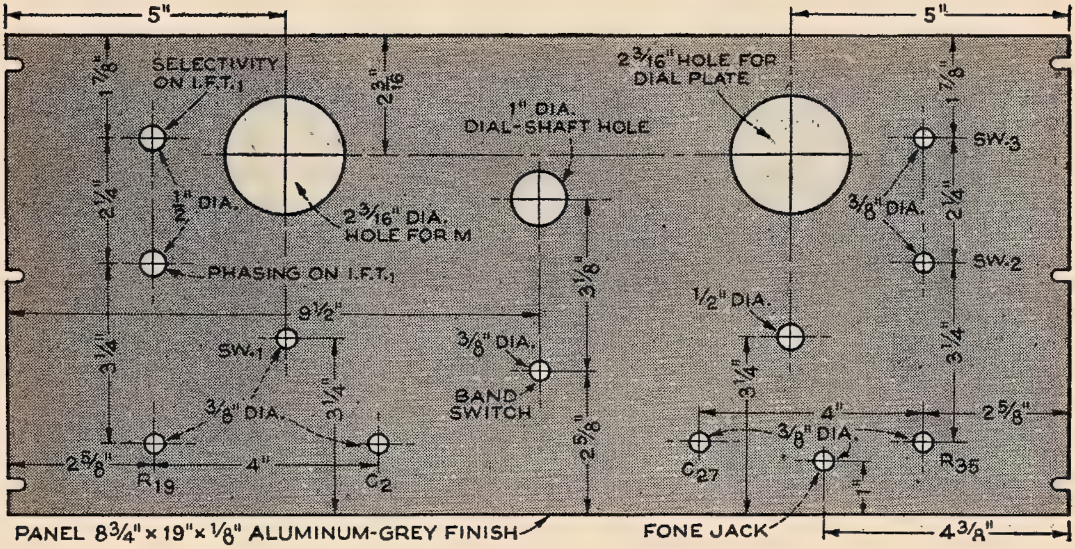
The meter is of the forward reading type, that is, it moves to the right as a signal comes


SHAFT END
BARE TWISTED LEADS
TRIMMER COND.
TUNE
C1
C2
R1
A
D
G
White
R.F.
Wh.-Black
Wh.-Brown
Blue-Wh.
MIXER
Wh.-Black
Wh.-Red
OSC.
Blue-Wh.
Wh.-Yellow
COIL UNIT
6AB7
V1
R2
R3
R4
C3
C4
6K8
V2
R5
R6
C5
C6
C7
6J7G
V3
R7
C8
VR150
V4
R8
R9
R10
R11
R12
C9
C10
C11
I.F.T.1
XTAL UNIT
White
Red
Green
R13
6K7
V5
R14
R15
C12
I.F.T.2
C13
C14
R16
R17
C15
6K7
V6
R18
C16
R19
R.F. GAIN
0-1 MA.
M
AVC.
R20
R21
OFF ON
SW.1
METER ZERO SET
R22
R23
C17
I.F.T.3
(SEE TEXT)
C18
C19
R25
R24
R26
R27
C20
SW-2
R28
R29
NOISE SIL. SW.
C21
C22
R30
R33
6H6
V7
V8
6N7
V9
R32
R31
C23
SHIELD
C25
I.F.T.4
C35
C26
C27
B.F.O. CONTROL
AUDIO GAIN
C24
C28
R34
R35
R36
R37
C30
FONES
6V6
V10
C29
SP'K'R. PLUG SOCKET
A
B
C
D
FIELD
T1
SPEAKER
C
D
C34
C33
SW.3
LINE & H.V. SWITCH
T2
ALL HEATERS
C36
5Z4
V11
A
B
CH
C31
C32
B+

PARTS LIST

V1—Type 6AB7 (Raytheon)
V2—Type 6K8 (Raytheon)
V3—Type 6J7G (Raytheon)
V4—Type VR150 (Raytheon)
V5, V6—Type 6K7 (Raytheon)
V7—Type 6H6 (Raytheon)
V8, V9—Type 6N7 (Raytheon)
V10—Type 6V6 (Raytheon)
V11—Type 5Z4 (Raytheon)
C1—3-gang, 280 mmf. dual purpose condenser (Meissner 21-5143 B)
C2, C27—15 mmf. variable condensers (Hammarlund HF-15)
C3, C8, C12, C14, C33, C34—.01 mf., 400 volt paper condensers (Cornell-Dubilier DT4S1)
C4, C10, C13, C18, C25—.01 mf., 600 volt paper condensers (Cornell-Dubilier DT6S1)
C5, C11, C15, C16, C20, C24, C36—.1 mf., 400 volt paper condensers (Cornell-Dubilier DT4P1)
C28—.1 mf., 600 volt paper condenser (Cornell-Dubilier DT6P1)
C6, C35—100 mmf., mica condenser (Cornell-Dubilier 5W5T1)
C7—25 mmf., mica condenser (Cornell-Dubilier 5W5Q25)
C9, C29—.002 mf., mica condenser (Cornell-Dubilier 1W5D2)
C17—.05 mf., 400 volt paper condenser (Cornell-Dubilier DT4S5)
C19, C21, C22—50 mmf., mica condenser Cornell-Dubilier 5WSQ5)
C23, C30—25 mf., 25 volt electrolytic condenser (Cornell-Dubilier BR252-A)
C31—Dual 8 mf., 450 volt electrolytic condenser (Cornell-Dubilier KRC588)
C32—8 mf., 600 volt electrolytic condenser (Cornell-Dubilier KR608)
R1, R17, R26, R29, R34—0.1 meg., ½ watt resistor I. R. C. BT ½)
R2, R14—50 ohm, ½ watt resistor (I. R. C. BT ½)
R3—100 ohm, ½ watt resistor (I. R. C. BT ½)
R4—30,000 ohm, 1 watt resistor (I. R. C. BT 1)
R5, R7, R11, R32—50,000 ohm, ½ watt resistor (I. R. C. BT ½)
R6, R15, R18—300 ohm, ½ watt resistor (I. R. C. BT ½)
R8, R20—1,000 ohm, 1 watt resistor (I. R. C. BT 1)
R9—10,000 ohm, 1 watt resistor (I. R. C. BT 1)
R10—50,000 ohm, 1 watt resistor (I. R. C. BT 1)
R12—5,000 ohm, 10 watt wire wound resistor (I. R. C. AB)
R13, R16, R25—5,000 ohm, ½ watt resistor (I R. C. BT ½)
R19—10,000 ohm, variable resistor (I. R. C. 14-116)
R21—0.1 meg. ohm, 1 watt resistor (I. R. C. BT 1)
R22, R31—500 ohm, 1 watt resistor (I. R. C. BT 1)
R23—1,000 ohm, variable resistor (I. R. C. 11-108)
R24, R27, R36—.1 meg., ½ watt resistor (I. R. C. BT ½)
R28—25,000 ohm, ½ watt resistor (I. R. C. BT ½)
R30—.25 meg. ohm, ½ watt resistor (I. R. C. BT ½)
R33—50,000 ohm, 50 watt wire wound resistor (I. R. C. EPA)
R35—.5 meg., variable resistor (I. R. C. 13-133)
R37—300 ohm, 10 watt wire wound resistor (I. R. C. AB)
Coil Set—5-band, 530 kc. to 32 mc. (Meissner 13-7603)

(The rest of the parts list will be found on page 151)



Drilling layout for the front panel of the "All-Wave Eleven."

in, and is set to zero with no signal input by means of resistor R23, which is placed on the chassis near the r.f. tube, with a knob above the chassis for ease of adjustment. This control will seldom need changing once it has been set.

The audio amplifier consists of two tubes, V9 and V10, and will produce 3 or 4 watts of output. While not exactly high fidelity, due to the sharply-tuned i.f. channel and other factors, the output tone quality is really very fine.

In addition to service as an audio amplifier, V9 also acts as a beat oscillator. All parts of the oscillating circuit are shielded with C26 and the secondary and tickler coils in the shield can above the chassis. The beat note is varied from the front panel by means of C27, which is placed at the rear of the chassis and operated by an extension shaft in order to keep the associated leads short. The beat oscillator is cut off by a very simple means. One tip of one of the rotor plates on C27 is bent out at an angle so that when turned fully counter clockwise it shorts the condenser and stops oscillation. This dodge makes for simplicity and is entirely practical.

The phone jack is inserted between V9 and V10 and is arranged so that when phones are in use the speaker output is nil. Since no d.c. flows through the phones, any type may be safely used.

About the only control not mentioned so far is SW3, which is a three-position unit. The left-hand setting is OFF, center is a.c. ON alone, or the standby position, and right is full ON for reception. An extra pair of binding posts at the rear of the chassis shunts the high voltage section of the switch so that the receiver may be silenced automatically by means of a relay when used with a transmitter.

The loud speaker plug has a connection in the power transformer primary circuit so that removal of the plug cuts the a.c. power input to the set, a measure of protection for the filter condensers.

While the total of 11 tubes is around average for a set of this type, two of these may be omitted if desired. Those are V4 and V8. The former, a voltage regulator, serves primarily to keep a steady input to the high-frequency oscillator, V3, regardless of line fluctuations. This is of great help when receiving c.w. signals, particularly on the higher frequencies. It also supplies regulated voltage to the screen grid of V2 and to the beat oscillator.

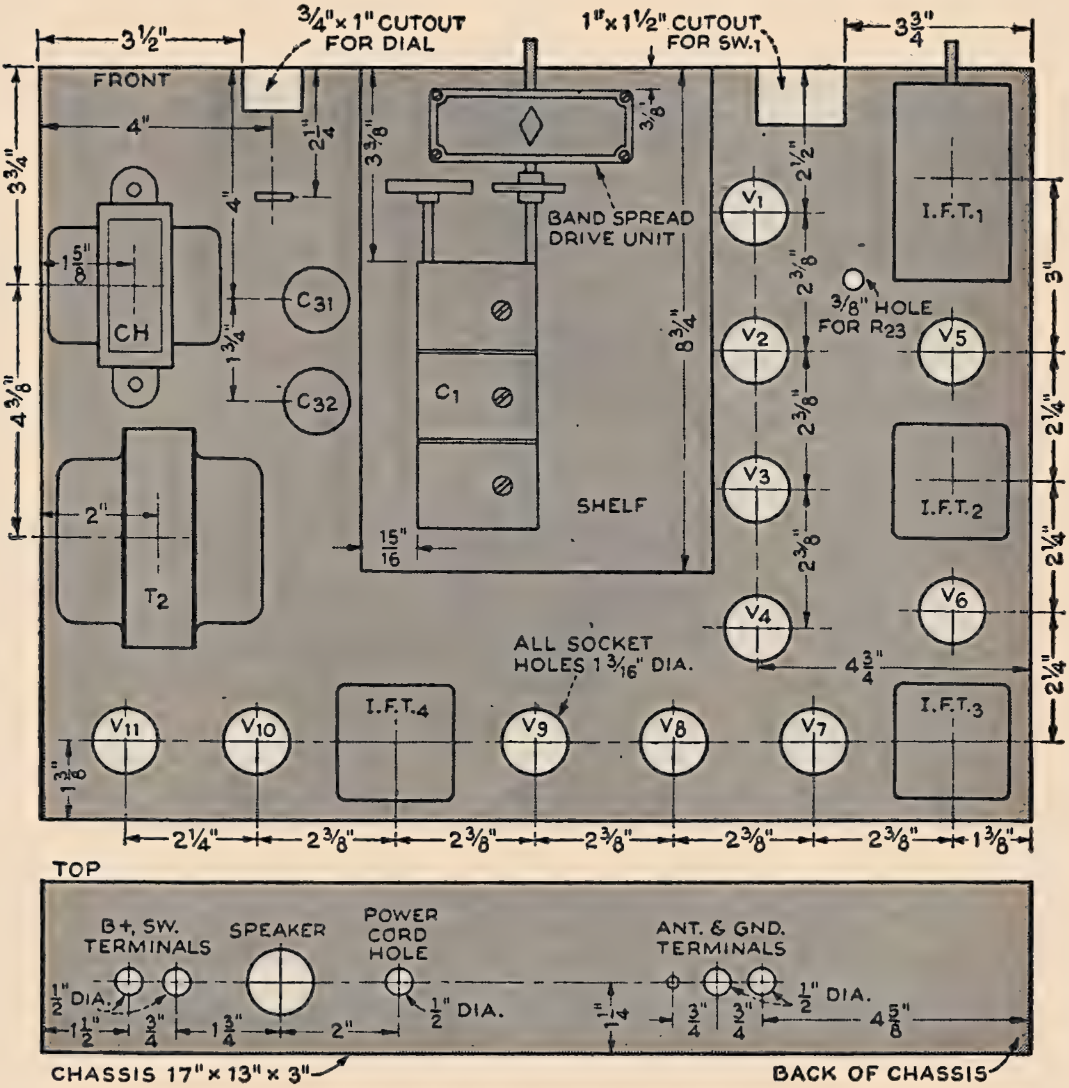
The noise silencer tube, V8, is also a sort of luxury and its omission will obviate the need for a flock of small parts. It is very useful, however, and should be retained if its extra cost is not objectionable. If not desired, the following parts may be omitted: V8, SW2, R26, R27, R30, C20, C22. Without this circuit the upper end of R28 would connect to the center tap on the secondary of IFT3 and to C19 and R24.

The noise silencer is of the greatest aid for weak signal reception and works best in reducing noises similar to auto ignition. It is therefore practically a necessity for those living near a well-traveled highway. Noises of the click and snap variety (including static) are reduced to the general level of the signal being received with a consequent great saving on the ears. Steady noises such as those produced by electric motors are not handled as well, although even here the reduction is often useful. So-called man-made noise is of course most bothersome on the higher frequencies, but the noise silencer is of considerable help when receiving weak stations even on the broadcast band.

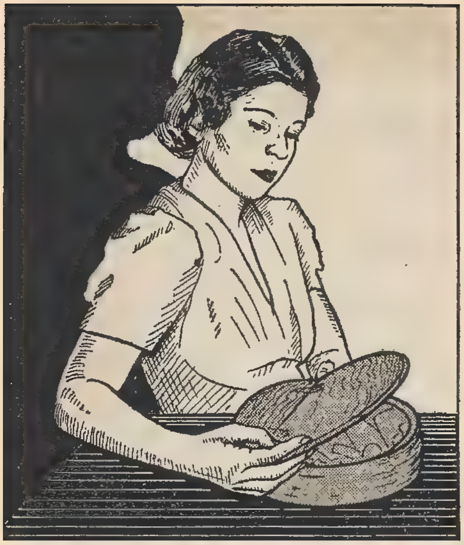
Another part which may be omitted is the crystal filter IFT1. If it is left out, it must be replaced by an I.F. transformer of the proper type such as a Meissner No. 16-6643. However, though the filter is a rather costly unit, the results obtained from it are of the greatest benefit, particularly if the receiver is to be used on the amateur bands or for c.w. reception.

By leaving out V4 and V8 with their associated circuits, the tuning meter, and the crystal filter, a goodly sum of money may be saved. If the proper socket and panel holes are provided, all these "luxuries" may be added at any future time with a minimum of trouble, while in the meantime the builder will have a perfectly workable receiver. It is, of course, strongly recommended that the whole thing be built at once if at all possible, as then the utmost in flexibility and utility will be available.

[*Continued on page* 149]

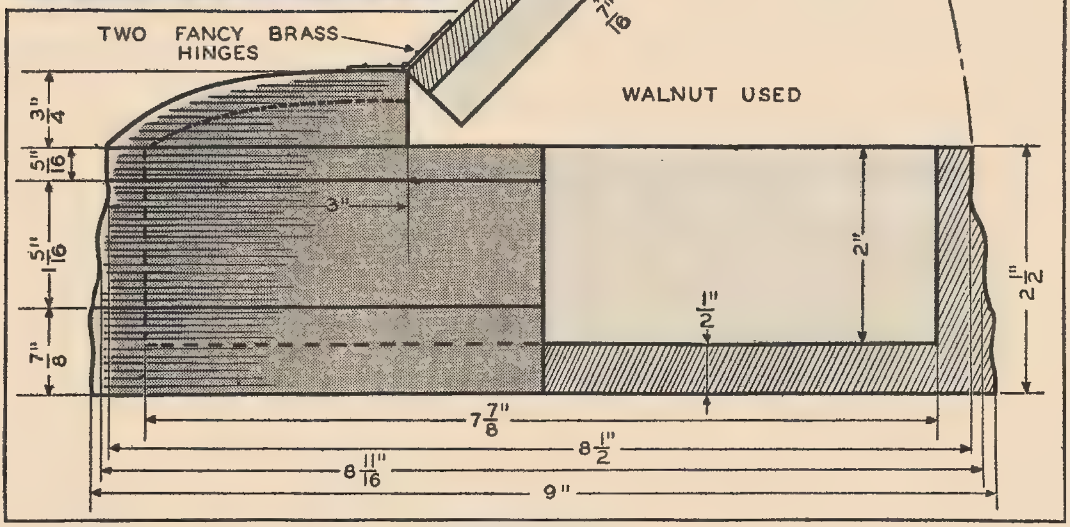

3½"
¾"×1" CUTOUT FOR DIAL
1"×1½" CUTOUT FOR SW.1
3¾"
FRONT
4"
2¼"
3⅜"
⅜"
3¾"
4"
1⅝"
CH
C31
C32
1¾"
4⅜"
BAND SPREAD DRIVE UNIT
C1
8¾"
SHELF
15/16"
2"
T2
V1
V2
V3
V4
V5
V6
V7
V8
V9
V10
V11
2½"
2⅜"
2⅜"
2⅜"
⅜" HOLE FOR R23
I.F.T.1
I.F.T.2
I.F.T.3
I.F.T.4
3"
2¼"
2¼"
2¼"
4¾"
ALL SOCKET HOLES 1 3/16" DIA.
1⅜"
2¼"
2⅜"
2⅜"
2⅜"
2⅜"
2⅜"
1⅜"
TOP
B+, SW. TERMINALS
SPEAKER
POWER CORD HOLE
ANT. & GND. TERMINALS
½" DIA.
1½"
¾"
1¾"
2"
½" DIA.
1¼"
¾"
¾"
½" DIA.
4⅝"
CHASSIS 17"×13"×3"
BACK OF CHASSIS

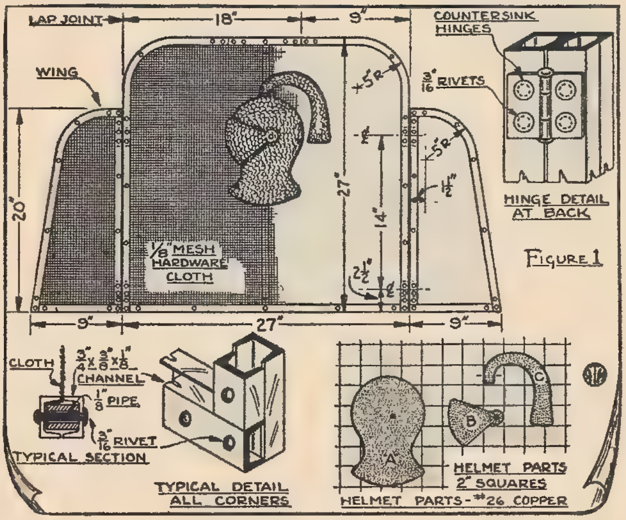
Drilling layout for the chassis of the receiver.



TURNED CANDY BOX

THIS candy box can be made from either two or three pieces of wood. If a piece can be obtained 9" in diameter, and 2½" thick, only one piece will be necessary for the bottom of the box. Otherwise bottom must be glued to side. Top is turned separately and attached with hinges.—*D.V.H.*


THE BOX IS IDEAL FOR CANDIES, COOKIES OR NUTS
5/16"
7/16"
TWO FANCY BRASS HINGES
WALNUT USED
3/4"
5/16"
1 5/16"
7/8"
3"
2"
1/2"
2 1/2"
7 7/8"
8 1/2"
8 11/16"
9"


LAP JOINT
18"
9"
WING
COUNTERSINK HINGES
3/16" RIVETS
5R
5R
1/2"
27"
14"
2 1/2"
20"
1/8" MESH HARDWARE CLOTH
HINGE DETAIL AT BACK
FIGURE 1
9"
27"
9"
CLOTH
3/4" x 3/8" x 1/8" CHANNEL
1/8" PIPE
3/16" RIVET
TYPICAL SECTION
TYPICAL DETAIL ALL CORNERS
A
B
C
HELMET PARTS 2" SQUARES
HELMET PARTS-#26 COPPER

KNIGHT FIRE SCREEN

THE enjoyment of a crackling wood fire can often be marred by flying sparks which are uncomfortable and dangerous. Then too, an attractive fire screen can add much in ornamental value. Here is an all metal fire screen that is not only easy to construct but rugged enough to last a lifetime. It is of such merit that it could not be purchased for twenty dollars although the materials may be purchased for a nominal amount.

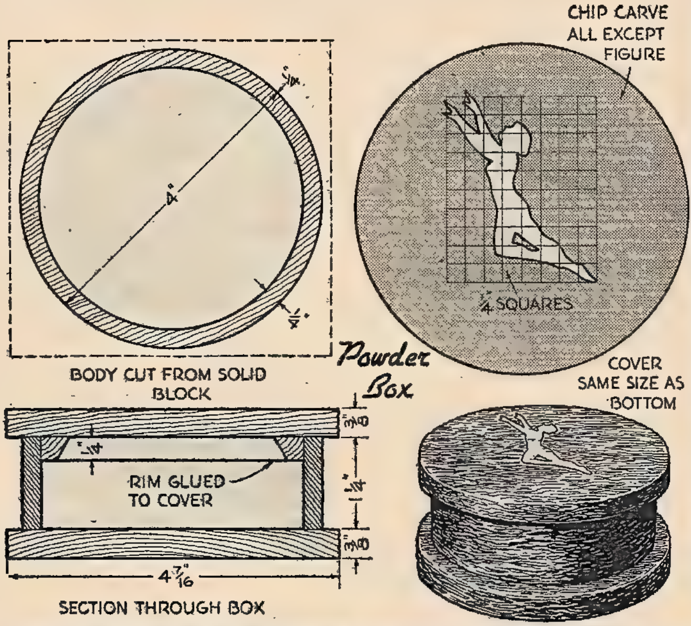
Small iron U-channel No. 15-

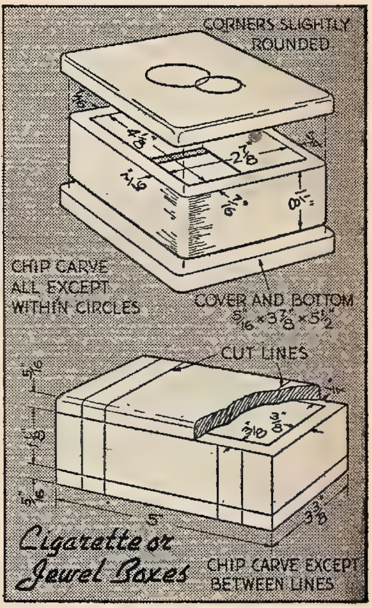
[*Continued on page* 147]

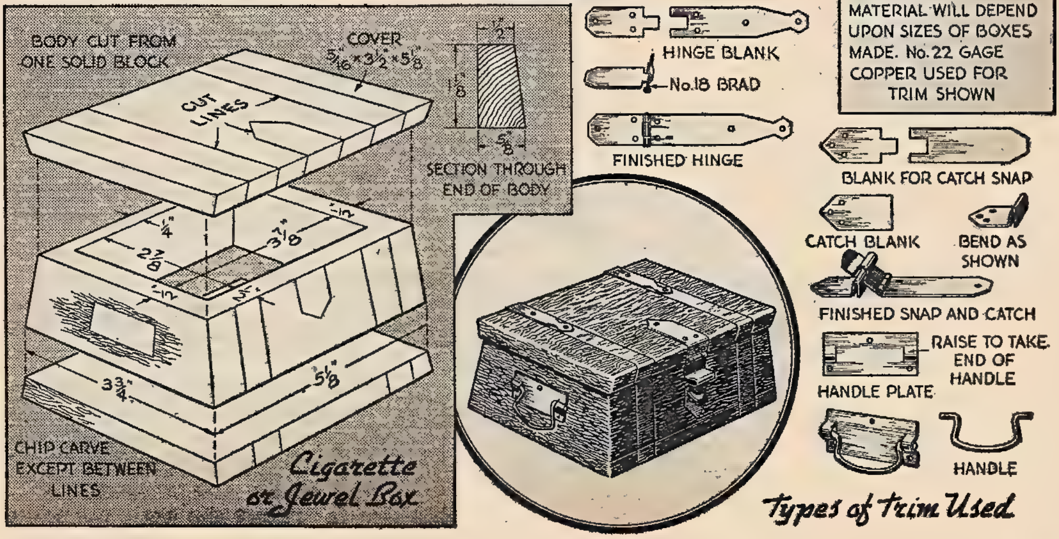
Boxes From Wood Blocks

NOVELTY boxes of any size and shape may be made from solid blocks of wood. When chip carved, trimmed in copper, and enameled, they are very attractive. White pine or basswood are among the best materials for this fascinating work because they carve well.

The body of the box is sawed out of a solid block of wood as shown, either on the jig saw or with a coping saw. The bottom is cut to size, and glued on with a good casein glue. The cover is made next, and if any design is to be applied, sketch this on with a pencil. Silhouettes such as that used on the powder box may be cut from magazines, and traced on the wood. Cut lines around all designs with a razor blade, then with a Number 3 gouge, chip carve all of the remainder of the box except the bottom.—*Dick Hutchinson.*


Powder Box
1/4"
4"
1/4"
BODY CUT FROM SOLID BLOCK
CHIP CARVE ALL EXCEPT FIGURE
1/4" SQUARES
3/8"
1/4"
RIM GLUED TO COVER
1 1/4"
3/8"
4 7/16"
SECTION THROUGH BOX
COVER SAME SIZE AS BOTTOM


Cigarette or Jewel Boxes
CORNERS SLIGHTLY ROUNDED
4 1/8"
2 7/8"
1/4"
1/4"
1 1/2"
7/16"
1 1/8"
CHIP CARVE ALL EXCEPT WITHIN CIRCLES
COVER AND BOTTOM 5/16"×3 7/8"×5 1/2"
CUT LINES
5/16
3/8"
3/8"
5/16
5"
3 3/8"
CHIP CARVE EXCEPT BETWEEN LINES


Cigarette or Jewel Box

Types of Trim Used

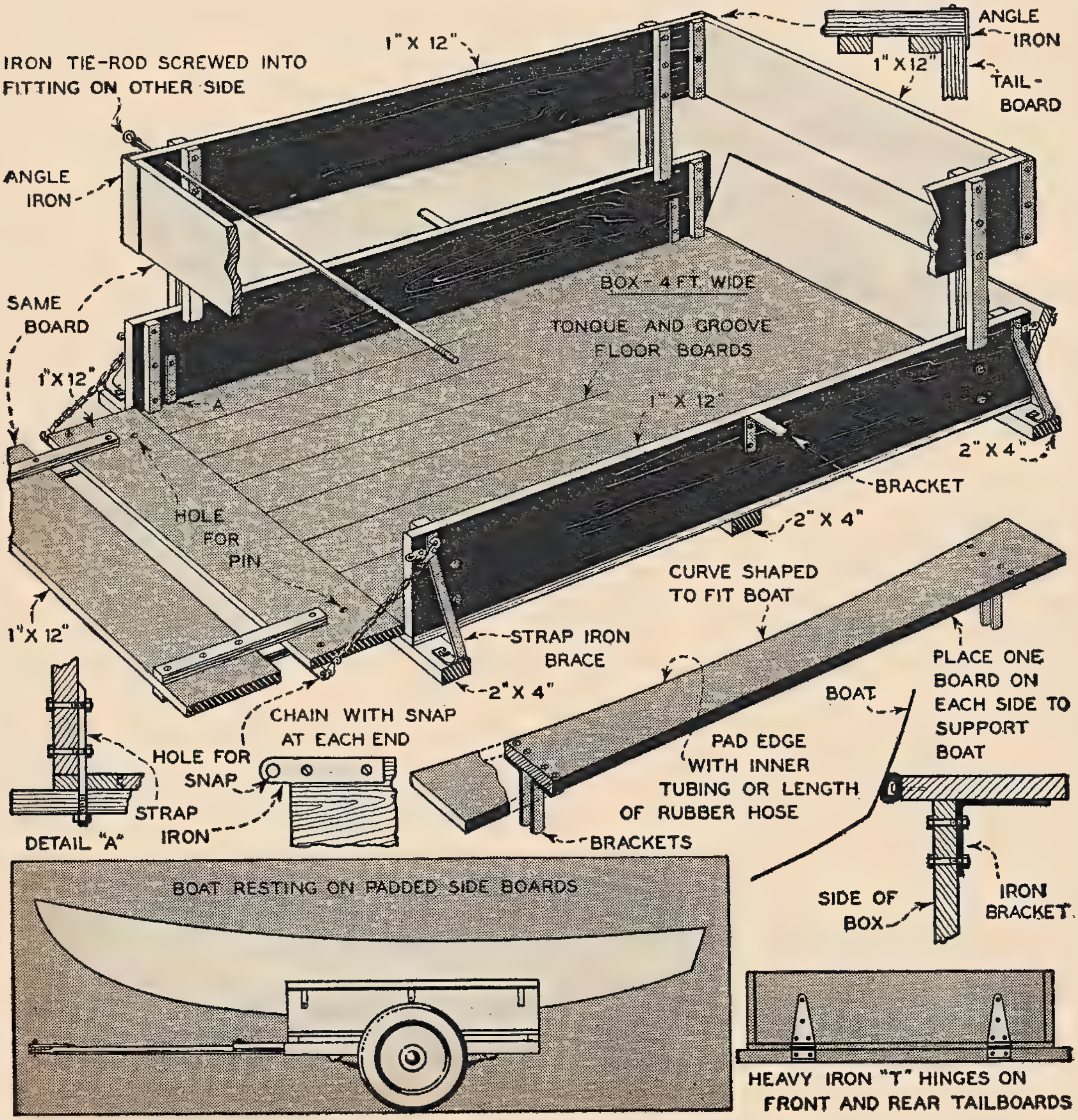
SIZES AND WEIGHT OF MATERIAL WILL DEPEND UPON SIZES OF BOXES MADE. No. 22 GAGE COPPER USED FOR TRIM SHOWN
BODY CUT FROM ONE SOLID BLOCK
COVER 5/16"×3 1/2"×5 5/8"
CUT LINES
1/2"
1 1/8"
5/8"
SECTION THROUGH END OF BODY
1/4"
1/2"
2 7/8"
3 1/8"
1/2"
3/4"
3 3/4"
5 1/8"
CHIP CARVE EXCEPT BETWEEN LINES
HINGE BLANK
No.18 BRAD
FINISHED HINGE
BLANK FOR CATCH SNAP
CATCH BLANK
BEND AS SHOWN
FINISHED SNAP AND CATCH
RAISE TO TAKE END OF HANDLE
HANDLE PLATE
HANDLE

Build This Convertible

THIS trailer may be built on the installment plan, additions and features being added as needed, and as time is found to build them. Many uses will be found for this convertible trailer.

As the original trailer often carries a ton or more, and is used continually, the chassis is all-steel. The axle and chassis frame are from a wrecked Chevrolet (front axle). A wrecking yard furnished everything except the ball hitch for $15.00. A strong 2-inch galvanized pipe is used for the extensible tongue. The auto frame is bent to a V at the front and fastened together at the tip of the V with two heavy steel plates, one above and one below—to leave room for the pipe tongue to slide through. One bolt through the tongue and the two plates is removed when adjusting the tongue to short or long position. The back end of the tongue is hammered flat and drilled for another strong bolt which goes through the angle-irons

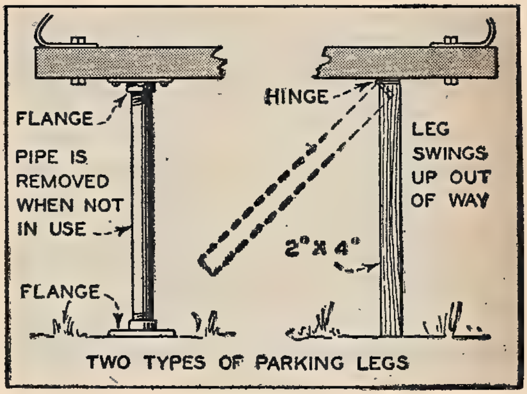
The drawings below show the "box" construction for hauling, and the adaptation for carrying boats. Note brackets.



1" X 12"
ANGLE IRON
1" X 12"
TAIL-BOARD
IRON TIE-ROD SCREWED INTO FITTING ON OTHER SIDE
ANGLE IRON
SAME BOARD
BOX - 4 FT. WIDE
TONGUE AND GROOVE FLOOR BOARDS
1"X 12"
A
1" X 12"
2" X 4"
BRACKET
HOLE FOR PIN
2" X 4"
CURVE SHAPED TO FIT BOAT
1"X 12"
STRAP IRON BRACE
2" X 4"
PLACE ONE BOARD ON EACH SIDE TO SUPPORT BOAT
BOAT
CHAIN WITH SNAP AT EACH END
HOLE FOR SNAP
PAD EDGE WITH INNER TUBING OR LENGTH OF RUBBER HOSE
STRAP IRON
DETAIL "A"
BRACKETS
BOAT RESTING ON PADDED SIDE BOARDS
SIDE OF BOX
IRON BRACKET
HEAVY IRON "T" HINGES ON FRONT AND REAR TAILBOARDS

All-Purpose Trailer

by W. Warren Anderson

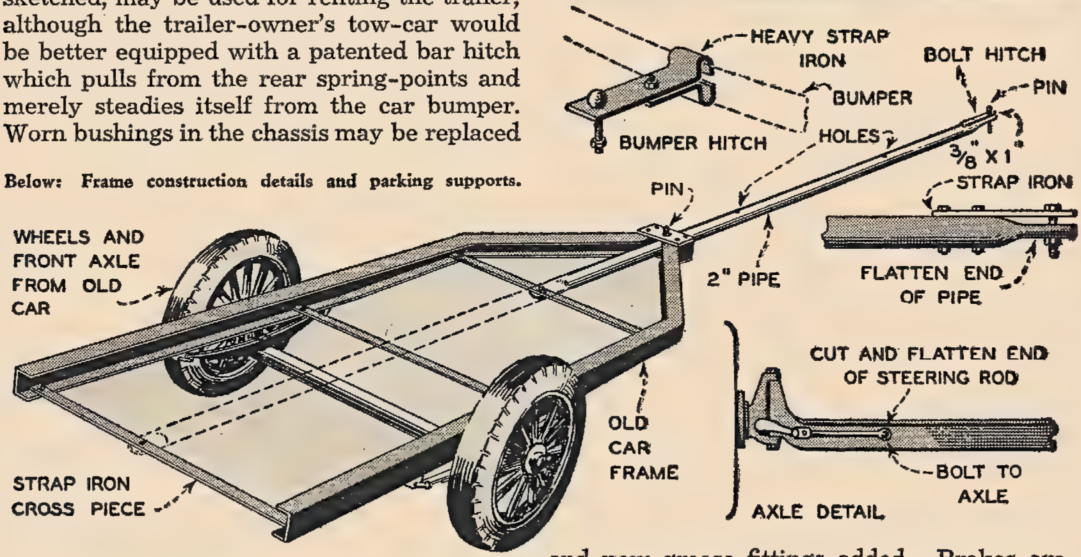

FLANGE
PIPE IS REMOVED WHEN NOT IN USE
FLANGE
HINGE
LEG SWINGS UP OUT OF WAY
2″x 4″

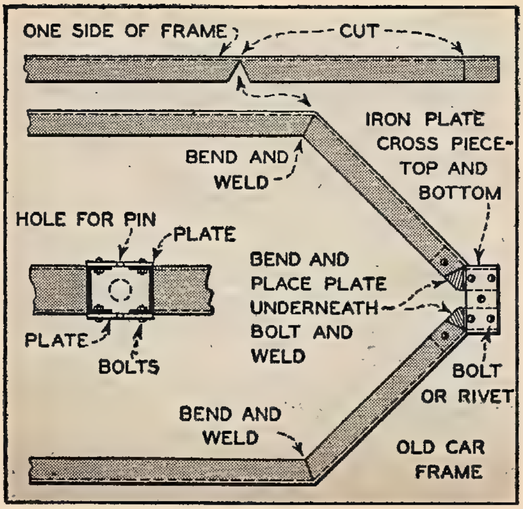
TWO TYPES OF PARKING LEGS

which serve as cross-members for the auto-frame at the rear and at the front where the V-bend begins. Another cross-member in the middle may also be drilled to afford a third, or medium position for the tongue. Corresponding bolt holes should be drilled in the tongue to take the bolt through the plates at the V in front. A simple bolt hitch may be made as shown in the sketch, although a ball and socket hitch of good strength is preferable. A removable bumper hitch, as sketched, may be used for renting the trailer, although the trailer-owner's tow-car would be better equipped with a patented bar hitch which pulls from the rear spring-points and merely steadies itself from the car bumper. Worn bushings in the chassis may be replaced and new grease-fittings added. Brakes are not retained, although they must be used unless the trailer is kept light enough to avoid the requirement of the state law for brakes. Wood 2″x4″ timbers could be used in place of the steel chassis but they are not as strong.

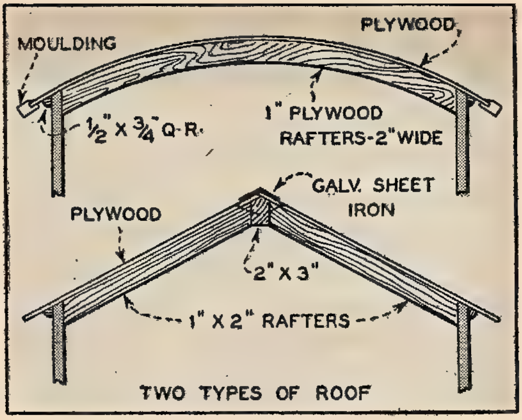
The basic box of this trailer should be strongly built to withstand its many uses. Cross-pieces (2″x4″) of oak or very hard yellow pine are best. The 1″x12″ sideboards and end gates are of hard straight-grain yellow pine. The flooring is 1″x4″ tongue and groove clear fir. Six heavy wagon-box body-irons and ready-made corner latches may be purchased from a hardware dealer. Four outside corner-braces of ⅛″x1″ strap iron must be made by a blacksmith. The top edge of the lower box is faced with 1⁄16″x¾″ bevel edged strap iron put on with flat-head

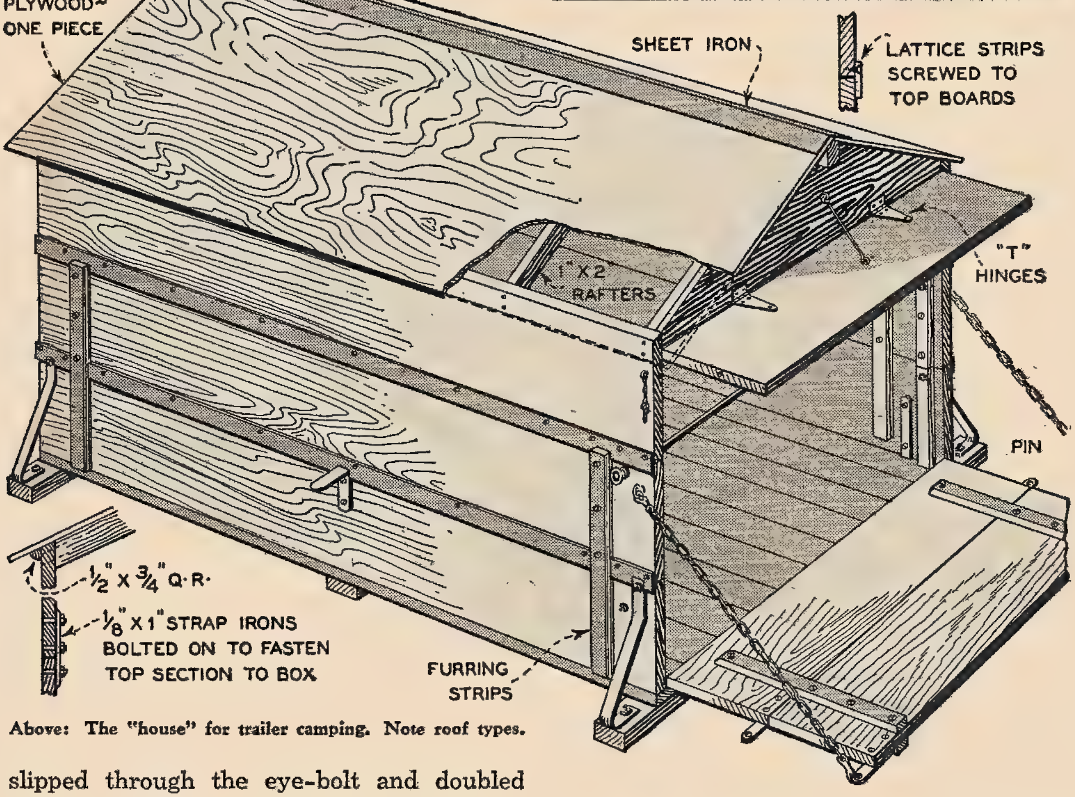
Below: Frame construction details and parking supports.


HEAVY STRAP IRON
BUMPER
BUMPER HITCH
HOLES
BOLT HITCH
PIN
⅜″ X 1″
STRAP IRON
PIN
2″ PIPE
FLATTEN END OF PIPE
WHEELS AND FRONT AXLE FROM OLD CAR
STRAP IRON CROSS PIECE
OLD CAR FRAME
CUT AND FLATTEN END OF STEERING ROD
BOLT TO AXLE
AXLE DETAIL


ONE SIDE OF FRAME
CUT
BEND AND WELD
IRON PLATE CROSS PIECE-TOP AND BOTTOM
HOLE FOR PIN
PLATE
PLATE
BOLTS
BEND AND PLACE PLATE UNDERNEATH-BOLT AND WELD
BOLT OR RIVET
BEND AND WELD
OLD CAR FRAME

screws through countersunk holes. Heavy 10″ strap hinges are used on the end gates, the bottom end of each hinge being bent around under the 2″x4″ cross-piece of the box for extra strength. Cow-chain with a heavy harness-snap at each end supports the end gates. An eye-bolt near the top of each corner of the box and a flat strap iron plate with projecting eye bolted to the four end gate corners, serves to receive the harness snaps. The chain is made just long enough to support the double-box end gate, and is slipped through the eye-bolt and doubled back to support the single end gate.


MOULDING
PLYWOOD
1/2" X 3/4" Q-R.
1" PLYWOOD RAFTERS-2" WIDE
GALV. SHEET IRON
PLYWOOD
2" X 3"
1" X 2" RAFTERS
TWO TYPES OF ROOF


OUTDOOR PLYWOOD~ ONE PIECE
SHEET IRON
LATTICE STRIPS SCREWED TO TOP BOARDS
1" X 2" RAFTERS
"T" HINGES
PIN
1/2" X 3/4" Q-R.
1/8" X 1" STRAP IRONS BOLTED ON TO FASTEN TOP SECTION TO BOX
FURRING STRIPS

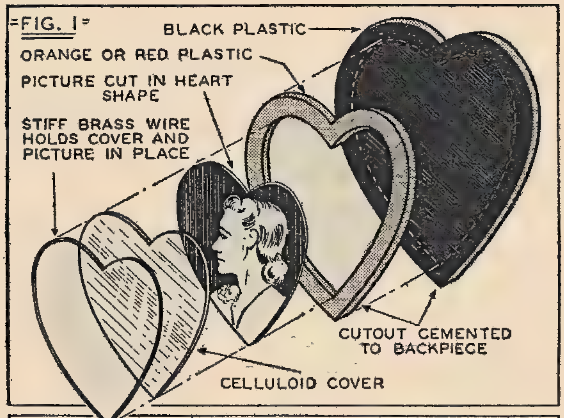
Above: The "house" for trailer camping. Note roof types.

Vertical battens of 1″x2″ are bolted to the sideboards with 1¾″x¼″ carriage bolts flat washers and lockwashers; these battens serve as stops. The balance of this trailer was planned to place the center of the axle 1½″ *behind the center of the box.* This avoids too much weight on the tow-car—loading should be done with this in mind, and all loads should be arranged so they will not shift their center of balance on the road. Too much weight on the tow-car necessitates adding leaves to the rear spring of the tow-car, which makes it hard riding at other times. Too much weight on the rear of a trailer makes it whip around on the road. About 100 pounds on the hitch is a good working weight for this trailer although 200 or even 250 will not overload the tow-car springs.

The boat-hauling attachments are made from 2″x8″ or larger planks, cut to fit the boat hull and well padded with old auto rubber or burlap and canvas pads tacked on over the curved edges. Fitted with two strong pairs of angle irons or shelf-brackets

[*Continued on page* 152]

VALENTINE HEARTS

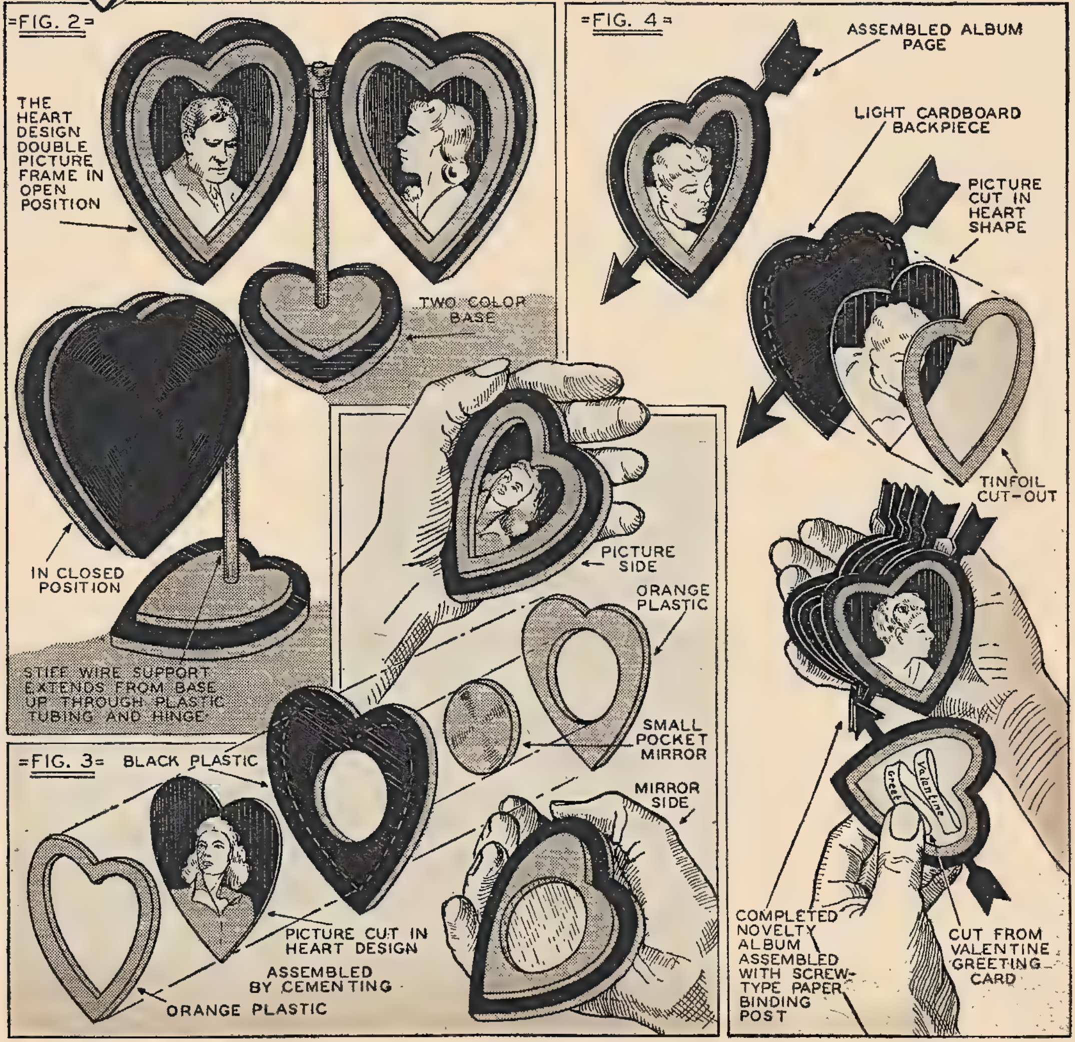

=FIG. 1=
BLACK PLASTIC
ORANGE OR RED PLASTIC
PICTURE CUT IN HEART SHAPE
STIFF BRASS WIRE HOLDS COVER AND PICTURE IN PLACE
CUTOUT CEMENTED TO BACKPIECE
CELLULOID COVER

by M. G. Winterton

YOUR handiwork will attract a special touch of personal appreciation in any one of these attractive projects you may choose to make up as a Valentine gift for your fair lady. A glance at the accompanying illustrations will give a clear idea of the different projects and their make-up.

The largest of these projects is the double heart picture frame with heart design pedestal base. Constructed of plastic of contrasting colors, it is very attractive and embodies a novel folding feature.

[*Continued on page* 154]


=FIG. 2=
THE HEART DESIGN DOUBLE PICTURE FRAME IN OPEN POSITION
TWO COLOR BASE
IN CLOSED POSITION
STIFF WIRE SUPPORT EXTENDS FROM BASE UP THROUGH PLASTIC TUBING AND HINGE
PICTURE SIDE
ORANGE PLASTIC
SMALL POCKET MIRROR
MIRROR SIDE
=FIG. 3=
BLACK PLASTIC
PICTURE CUT IN HEART DESIGN
ASSEMBLED BY CEMENTING
ORANGE PLASTIC
=FIG. 4=
ASSEMBLED ALBUM PAGE
LIGHT CARDBOARD BACKPIECE
PICTURE CUT IN HEART SHAPE
TINFOIL CUT-OUT
Valentine
Greet
COMPLETED NOVELTY ALBUM ASSEMBLED WITH SCREW-TYPE PAPER BINDING POST
CUT FROM VALENTINE GREETING CARD

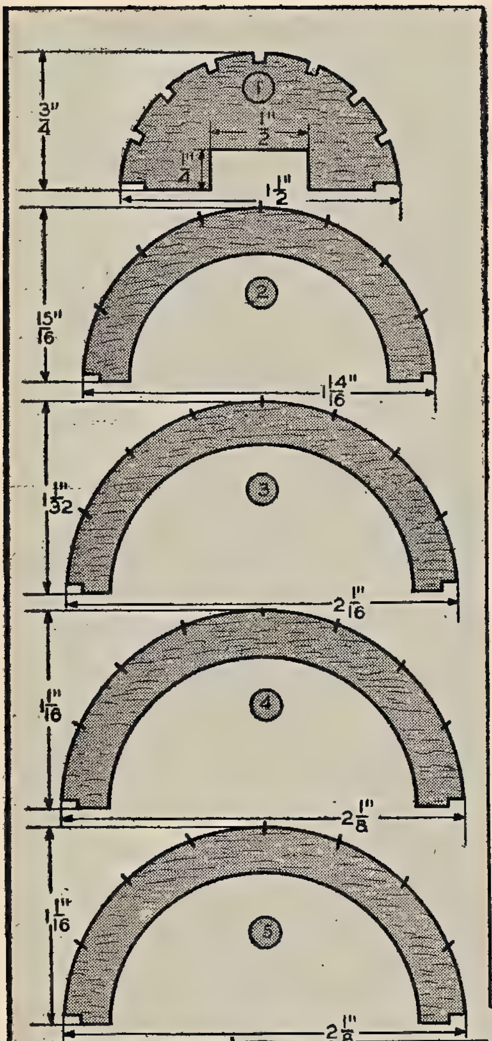
The Vultee Vanguard

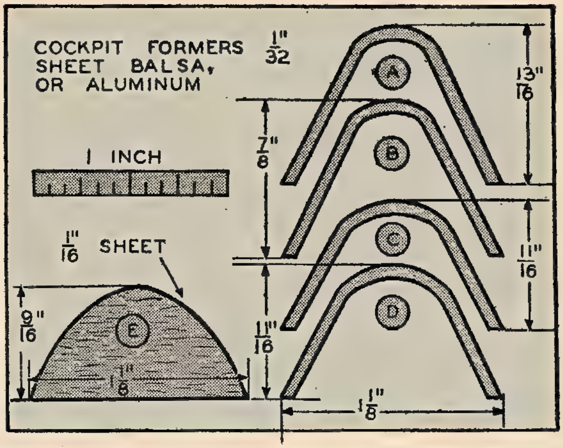
by Ralph Baker, Jr.

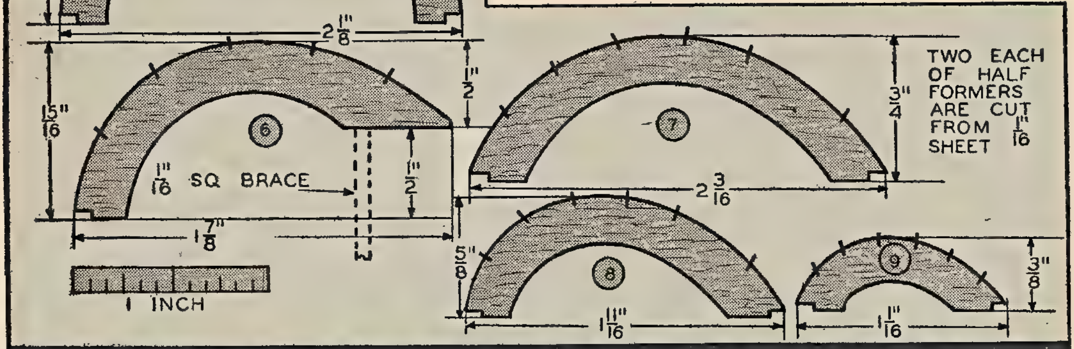
NEW fighting planes that come out these days rarely have a speed of less than 300 miles per hour. The demand is for speed, and more speed. It is usually necessary for these planes to gain altitude in a very short time. In answer to this ever increasing demand for speed combined with maneuverability, the Vultee Company has built the Vanguard.

Powered by an 1100 horsepower Pratt and Whitney Twin Wasp engine this plane rockets skyward at the rate of 6,000 feet per minute. It has a top speed well over 350 miles per hour. It is no piker in armaments, either. In all, it can mount ten or twelve guns; these firing through the propeller, from the wings, and from the tail.

The model is very good looking and is an


①
3"/4
1"/2
1"/4
1 1"/2
②
15"/16
1 14"/16
③
1 1"/32
2 1"/16
④
1 1"/16
2 1"/8
⑤
1 1"/16
2 1"/8


COCKPIT FORMERS 1"/32 SHEET BALSA, OR ALUMINUM
1 INCH
1"/16 SHEET
Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
9"/16
1 1"/8
13"/16
7"/8
11"/16
11"/16
1 1"/8


⑥
15"/16
1"/2
1"/16 SQ BRACE
1"/2
1 7"/8
1 INCH
⑦
3"/4
TWO EACH OF HALF FORMERS ARE CUT FROM 1"/16 SHEET
2 3"/16
⑧
5"/8
1 11"/16
⑨
3"/8
1 1"/16

The above bulkhead and cockpit former diagrams are full size. Trace on balsa with carbon paper.

—Flying Model

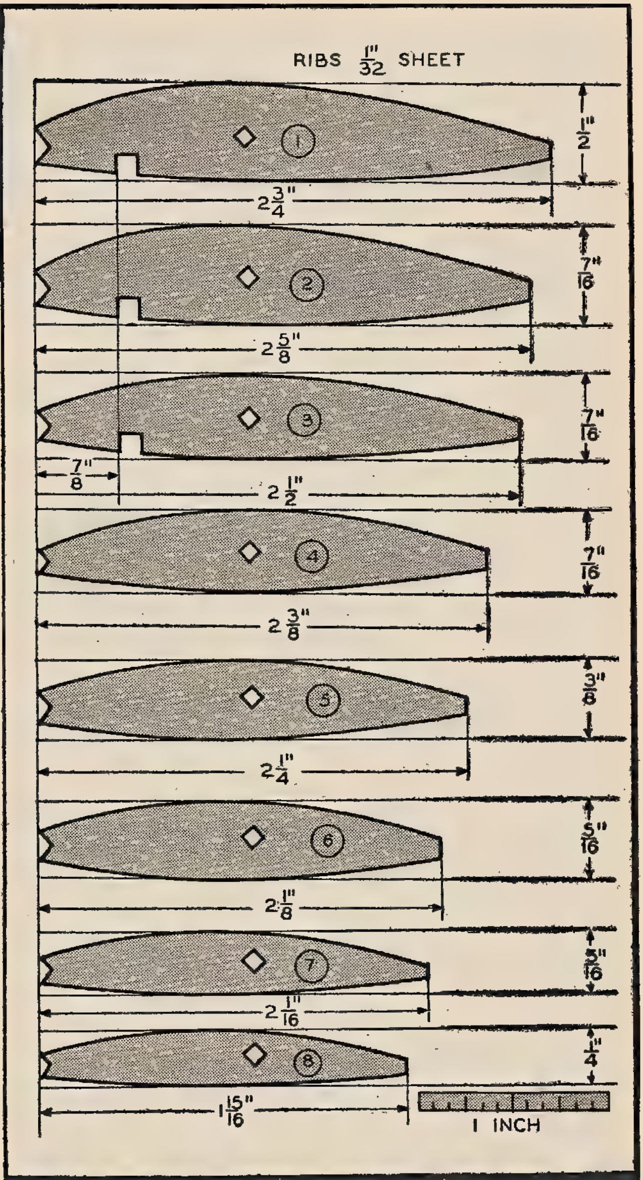
Photograph on page 95.

excellent flier for its type. The construction is not difficult, even though it retains many features of its prototype. Be sure to look the plans over carefully before starting construction.

Fuselage

To construct the fuselage, trace the shapes of the bulkheads (which are shown full size) with the aid of carbon paper. Cut them from $\frac{1}{16}$″ sheet. Only half of each bulkhead is shown on the plan. Cut two of each type. Next lay out side plan according to dimensions. Pin the keels over the plan and cement half of the bulkheads in position. After the cement has dried remove frame from the plan and add the other half of the bulkheads to the frame.

Now cement the $\frac{1}{16}$″ square stringers over the bulkheads. The fuselage can be kept from getting out of line by adding the opposite stringer each time one is cemented on. Cement the spinner block to the No. 1 bulkhead with several tiny drops of cement so that it can be shaped more easily and then removed. Sandpaper the whole fuselage framework smooth. Do not cover the fuselage at this time.



The rib plans above are actual size. Model can be built twice size shown, if desired, by doubling all dimensions.

Wing

Make the two wing panels on a full sized sketch of the plan. The ribs are shown full size. Make a plan of the other half of the wing by tracing it on semi-transparent paper, then turning the tracing over. Cut the ribs from $\frac{1}{32}$″ sheet balsa of medium weight, and sandpaper them. The leading and trailing edges and the spar should be of hard balsa. Sandpaper the wings when glue is dry.

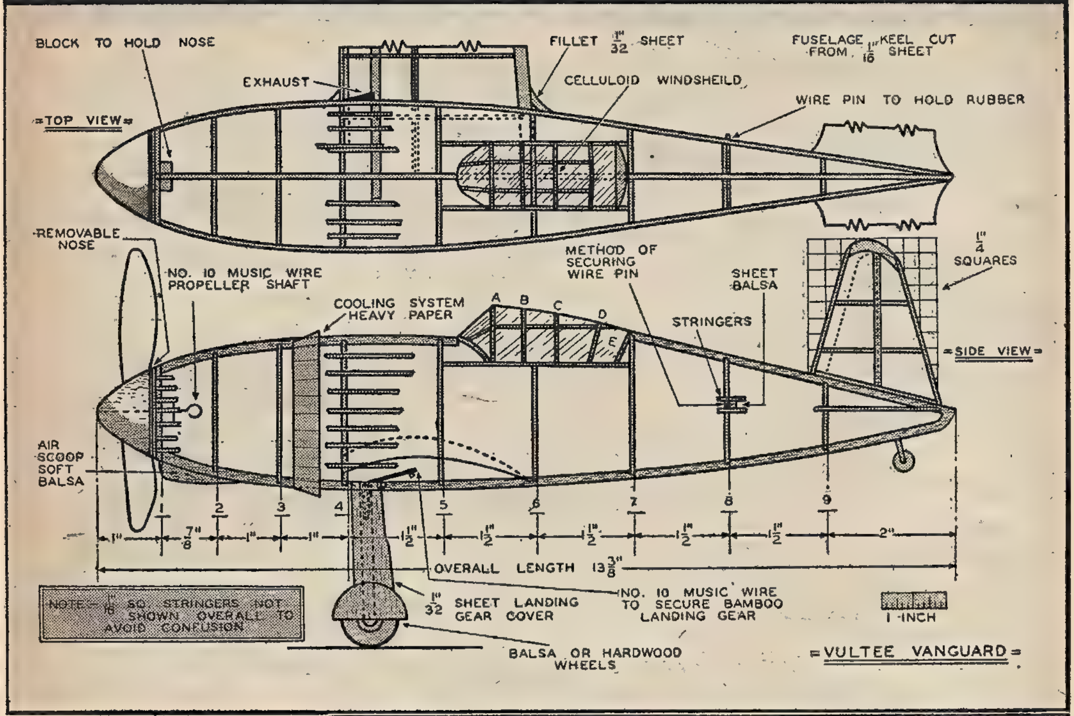
Tail Surfaces

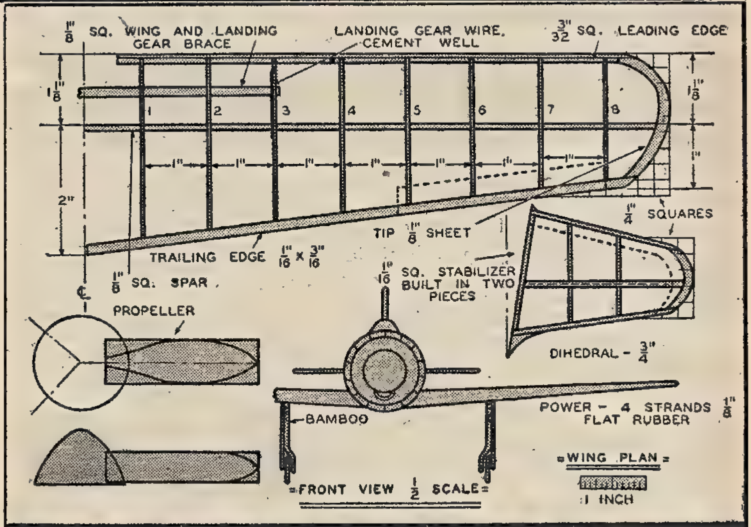
The tail surfaces have been enlarged for the model for more efficient flying. The stabilizer is built in two pieces and cemented on each side of the fuselage after covering.

Propeller

A three bladed propeller is used as on the real plane. Carve three blades from balsa

Build fuselage according to dimensions shown on drawing below. Assemble in halves as instructed.


BLOCK TO HOLD NOSE
EXHAUST
FILLET 1/32" SHEET
FUSELAGE KEEL CUT FROM 1/16" SHEET
CELLULOID WINDSHEILD
WIRE PIN TO HOLD RUBBER
=TOP VIEW=
REMOVABLE NOSE
NO. 10 MUSIC WIRE PROPELLER SHAFT
METHOD OF SECURING WIRE PIN
SHEET BALSA
1/4" SQUARES
COOLING SYSTEM HEAVY PAPER
A B C D E
STRINGERS
=SIDE VIEW=
AIR SCOOP SOFT BALSA
1 2 3 4 5 6 7 8 9
1" 7/8" 1" 1" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 2"
OVERALL LENGTH 13 3/8"
NOTE— 1/16 SQ. STRINGERS NOT SHOWN OVERALL TO AVOID CONFUSION
1/32" SHEET LANDING GEAR COVER
NO. 10 MUSIC WIRE TO SECURE BAMBOO LANDING GEAR
1 INCH
BALSA OR HARDWOOD WHEELS
=VULTEE VANGUARD=


1/8" SQ. WING AND LANDING GEAR BRACE
LANDING GEAR WIRE. CEMENT WELL
3/32" SQ. LEADING EDGE
1 1/8"
1 2 3 4 5 6 7 8
1" 1" 1" 1" 1" 1" 1"
2"
1 1/8"
1"
1/4" SQUARES
TIP 1/8" SHEET
TRAILING EDGE 1/16" x 3/16"
1/8" SQ. SPAR
1/16" SQ. STABILIZER BUILT IN TWO PIECES
℄
PROPELLER
DIHEDRAL - 3/4"
BAMBOO
POWER - 4 STRANDS 1/8" FLAT RUBBER
=WING PLAN=
=FRONT VIEW 1/2 SCALE=
1 INCH

Follow plans above in assembling wing. Lay out according to dimensions.

blocks ½"x¾"x2¼" and cement in notches in the spinner 120 degrees apart. Be sure to carve right hand prop blades.

To make the removable nose, cut a piece of $\frac{1}{16}$" sheet balsa the same shape as bulkhead No. 1. Cement to the back of this piece a balsa block to fit the hole in bulkhead No. 1. Then cement a washer on either side of the prop shaft hole. Bend the prop shaft from No. 10 music wire. Another washer is put on the prop shaft between the prop and the nose block as a bearing. Another washer is cemented to the back of the prop hub. Paint the prop and spinner with clear dope before coloring them.

Covering

The original model is covered with silver tissue. Any other color may be used, however, though the real plane is the natural metal color. Attach the wing to the fuselage before covering the model. Put on the landing gear also before covering the model. The landing gear is bamboo and wire. Bend the bamboo to shape by heating. Bend the wire

[*Continued on page* **145**]

HOW TO USE NAILS

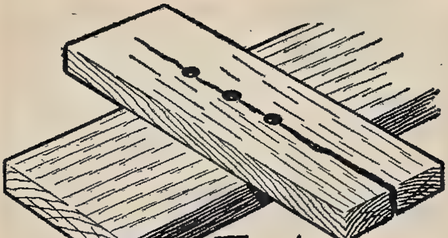


Fig. 1

HOW NOT TO USE NAILS.
NAILS IN LINE–TIMBER SPLITS

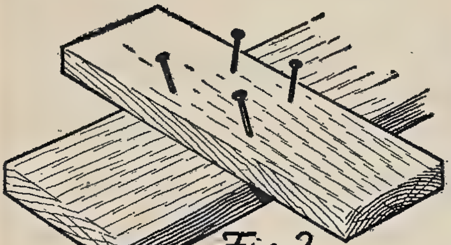
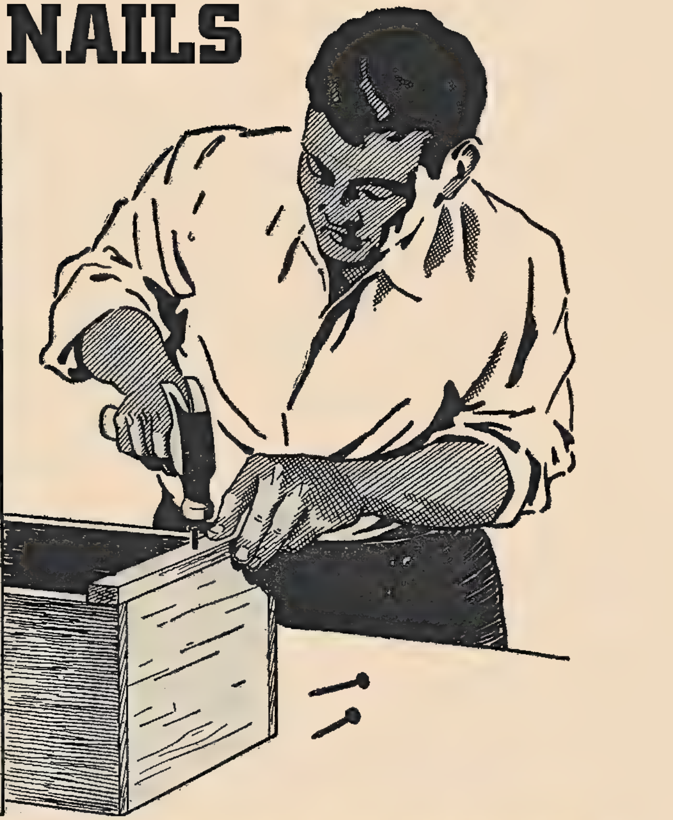


Fig. 2

NAILS SET AT VARYING ANGLES
HOLD BETTER



Don't hammer like the workman above. He's holding the hammer too close to the head and has his left index finger in a dangerous spot. Note how grain lined nails have wood in Fig. 1. Angle driven nails in Fig. 2 hold better.

by Walter S. Chansler

IT IS surprising how few people there are who know how to use nails. Most people, perhaps, have given the subject little or no thought; or what little thought they have given it has been relative to how to use nails so as to add to the attractiveness of the job rather than to the efficiency of the work.

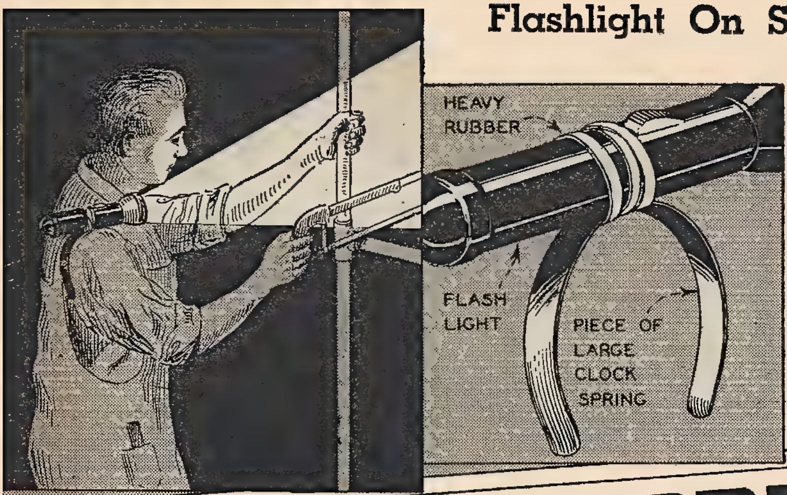
To use nails efficiently, one must know woods, their nature, consistency, inherent qualities. Nails hold much better in hard woods than they do in soft woods. Some woods have a tendency to split easily, while others are tough and split only under great strain. The texture of some woods calls for long slim nails, while that of other woods is such that much shorter, thicker nails may be used effectively. All such factors govern the proper use of nails.

All kinds of timber are composed of minute particles or fibers. These are arranged in various orders in the different kinds of wood, being held together by a certain inherent attractive force known as molecular force. This varied arrangement of these fibers or particles together with their composition determine the grain and consistency of the various woods. When we drive a nail into a block of wood we displace these particles and create a force antagonistic to the attractive force of the wood fibers. If this displacement is such as not to overbalance the molecular force, the nail holds firmly, but if the displacement is so great that the molecular force is overcome, then the wood splits along the line of least resistance. This is always with the grain. Consequently the nail, having no antagonistic force to the displacement of wood particles which its entrance has produced, fails to hold.

The common error in using nails is to line off the timbers and drive the nails at equal distances along this line. This is a mistake of the worst kind. For instance, assume you are nailing a cleat to a plank. If you

[*Continued on page* 154]

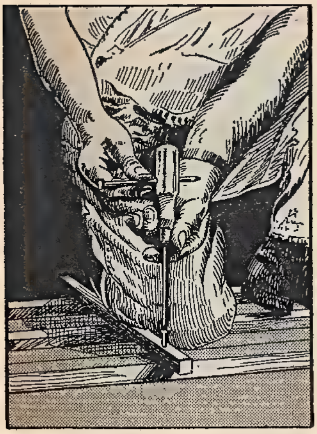
Flashlight On Shoulder Clamp


HEAVY RUBBER
FLASH LIGHT
PIECE OF LARGE CLOCK SPRING

WHEN doing any type of work in the dark that requires both hands, this easily made shoulder clamp will hold your flashlight so as to shine on the work. A section of a large clock spring is cut as shown. Ends must be ground round so they won't tear.

FOR ENTERPRISING

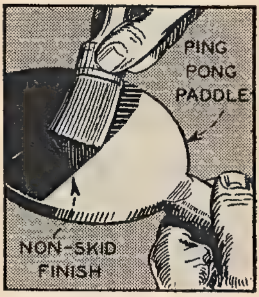
Nail Through Screwdriver Makes Working Easier



WHEN driving screws in hard wood, a hole bored through the handle of the screwdriver as shown, will be a great help. A large nail can be inserted through the hole to act as a lever, when desired.—*A. V.*

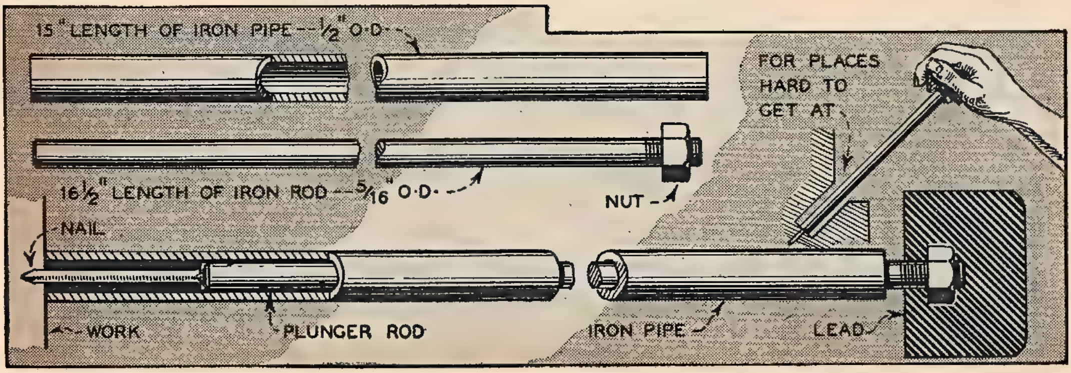
Non-Skid Wood Finish

A TEASPOONFUL of powdered pumice stone mixed with two ounces of white or orange shellac or varnish, makes an inexpensive and easily applied non-skid finish for table tennis paddles, etc.


PING PONG PADDLE
NON-SKID FINISH

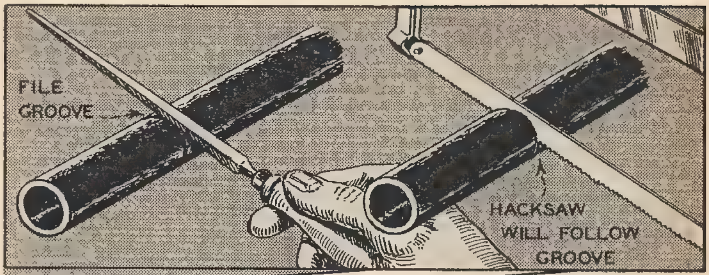
"Tight Spot" Nail Driver

NAILS can easily be driven into surfaces ordinarily difficult to reach when this simple tool is used. Made from a $\frac{5}{16}$" iron rod and a length of ½" O.D. iron pipe, it will be a great aid to the woodworker.—*A. T.*


15" LENGTH OF IRON PIPE--½" O.D.
16½" LENGTH OF IRON ROD--5/16 O.D.
NUT
FOR PLACES HARD TO GET AT
NAIL
WORK
PLUNGER ROD
IRON PIPE
LEAD

Making Square Hacksaw Cuts On Pipe

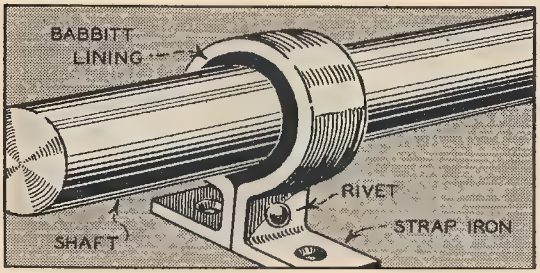
IT IS often desirable to cut off a piece of pipe with a hacksaw in such a way as to be certain the cut will be squared. One method of assuring a square cut consists of first filing a shallow groove around the pipe with a 3-cornered file. The saw will follow the groove.

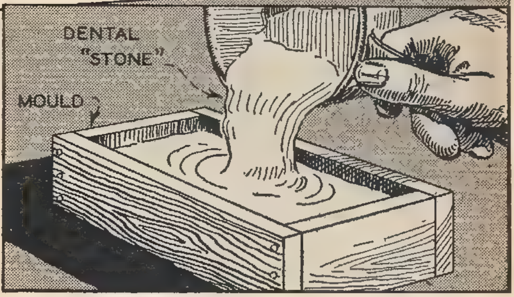

FILE GROOVE
HACKSAW WILL FOLLOW GROOVE

SHOP HOBBYISTS

Simple Shaft Bearings

LINE shaft bearings for machine tools can be made of strap iron $\frac{3}{16}''$ thick and about 1" wide. Bend iron first, then pour the babbitt. Drill oil hole in top.—*H. J.*


BABBITT LINING
RIVET
STRAP IRON
SHAFT

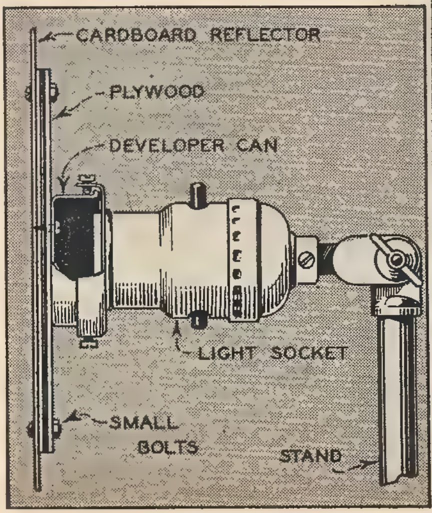

DENTAL "STONE"
MOULD

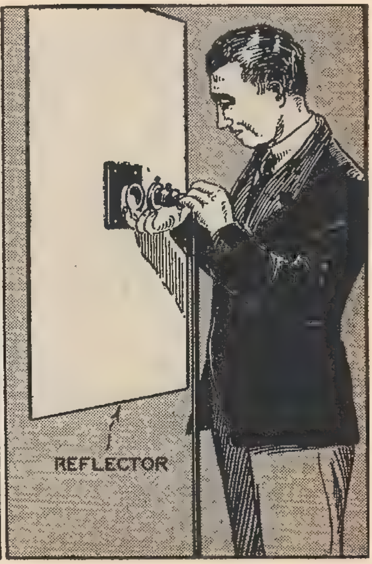
Dental Stone For Moulds

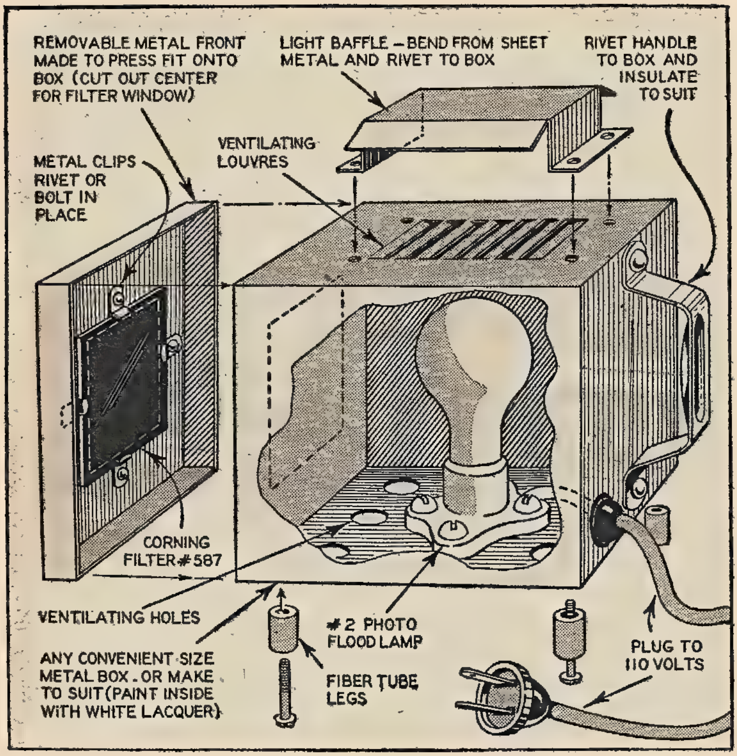
SOME of the uses to which amateur mechanics put plaster of Paris will be much better filled by dental "stone." This is a compound used by dentists. It costs about 15c a pound, is very strong and may be used for foundry patterns.—*C. B.*

Holder For Cardboard Reflectors

CARDBOARD reflectors can be adapted for mounting on bridge lamps and portable photolight stands by making use of the top container of a two quart developer can. Readily snapped into the shade bracket, into which it fits perfectly, the adapter can be locked in place by tightening the bracket set screws. A small plywood panel supports the cardboard.—*J. M.*


CARDBOARD REFLECTOR
PLYWOOD
DEVELOPER CAN
LIGHT SOCKET
SMALL BOLTS
STAND




REMOVABLE METAL FRONT MADE TO PRESS FIT ONTO BOX (CUT OUT CENTER FOR FILTER WINDOW)
LIGHT BAFFLE – BEND FROM SHEET METAL AND RIVET TO BOX
RIVET HANDLE TO BOX AND INSULATE TO SUIT
METAL CLIPS RIVET OR BOLT IN PLACE
VENTILATING LOUVRES
CORNING FILTER #587
VENTILATING HOLES
ANY CONVENIENT SIZE METAL BOX - OR MAKE TO SUIT (PAINT INSIDE WITH WHITE LACQUER)
#2 PHOTO FLOOD LAMP
FIBER TUBE LEGS
PLUG TO 110 VOLTS

An AC-DC lamp for use in home or laboratory. Oil can will make a suitable box.

Prospecting With Black Light

[*Continued on page* 97]

them for a few seconds. Uncannily, they spit flame for seconds or perhaps minutes after the torch has passed on. Recently an amateur prospector found a piece of willemite that glowed so brilliantly he could read a newspaper by its light. It kept right on glowing for nearly two hours!

War needs are booming black light prospecting for scheelite, ore of tungsten, which looks just like common rock among which it is found, but under the torch glows a brilliant blue. Miners use mercury-vapor lamps to follow the vein, to sort ore from worthless rock, and to test waste on the dump to be sure all the tungsten has been removed. One mill found unsuspected ore only a quarter of a mile away. On test it proved far richer than where they had been working three years! A prospector crawled down into six "gopher holes" where an earlier miner in search of lead had burrowed. A blue gleam under the torch revealed all of them heavy with tungsten ore.

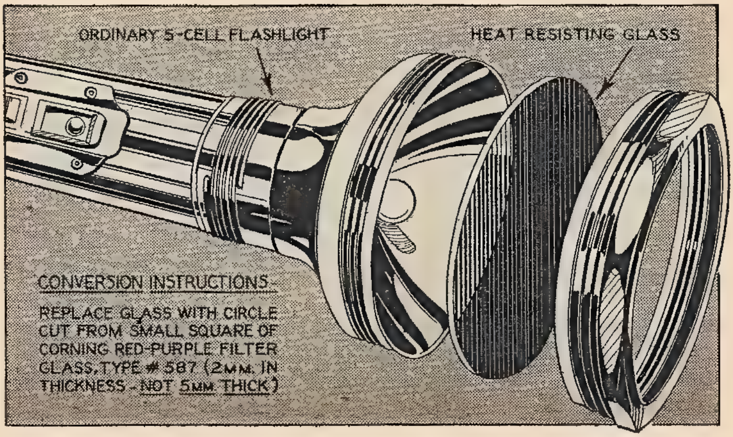
Recently an amateur prospector noticed a yellow mineral cast aside by miners as valueless, but which glowed strangely under his ultraviolet lamp. Assay revealed a large percentage of uranium—mother ore of radium!

Simplest and cheapest homemade lamp for night prospecting is an ordinary five-cell flashlight whose lens has been replaced with a Corning filter of the red-purple Type No. 587. A 3/8" square (stock size) from which the required circle can be cut, costs $1.50. This torch will cause many fluorescent minerals to glow if held within an inch or so of the lamp.

For a stronger torch, mount an ordinary photoflood bulb in a metal box with plenty of ventilation to dissipate heat. Cut a window in the front and mount a Heat-Resisting Type 587 filter over it. Be sure the ventilating holes don't leak light, blanking out the glow of the rocks.

Still more ultraviolet, and correspondingly better effects, can be had with a 25-watt light "black light bulb." Like the photoflood, this runs on 110 volts, t.c. or d.c., and needs no filter, but does not need to be enclosed. Never operate this type of bulb more than five to ten minutes at a time, as they get very hot and may swell up dangerously—and *don't* mount them close to anything that will burn.

For field prospecting, however, the photoflood and black bulb are out of the question because


ORDINARY 5-CELL FLASHLIGHT
HEAT RESISTING GLASS

CONVERSION INSTRUCTIONS–
REPLACE GLASS WITH CIRCLE CUT FROM SMALL SQUARE OF CORNING RED-PURPLE FILTER GLASS, TYPE # 587 (2MM. IN THICKNESS - NOT 5MM THICK)

Right: The flashlight ultraviolet torch. Filter comes 3⅛" square, standard size, which is just right to obtain the correct sized circle.

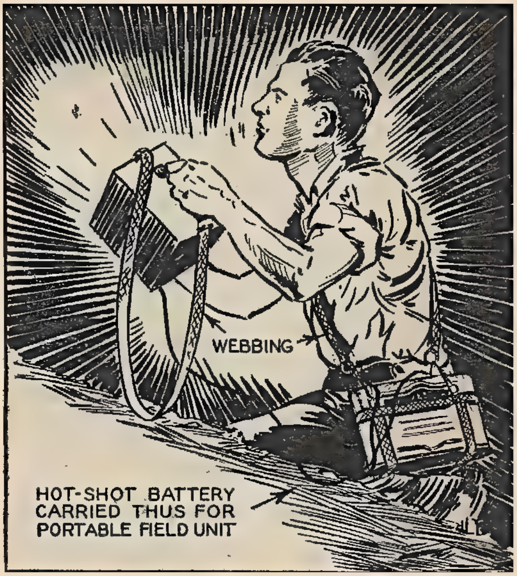
portable current supply is impractical. Fortunately, the General Electric Company now is making a small argon-filled glow bulb which has no filament and lends itself well to portable units. It fits a standard lamp socket and operates from 90 volts or more of radio "B" battery, or from a small spark coil such as that from a Model "T" Ford. Best of all, it sells for only fifty cents. A bank of four, placed close together with a reflector behind, makes a convenient outfit which needs no filter because little visible light is produced. The Ford coil can be operated from a six-volt "Hot-Shot" battery, or four standard dry cells taped together and slung on shoulder straps. Adjust the vibrator so the coil gives the fattest spark, as determined by a short spark gap between two wires attached to the secondary terminals. Be sure of all wires leading from the secondary of the coil to the glow lamps are well insulated, as the high-voltage can give you a nasty bite.

One ingenious prospector operates his lamp by wires attached to the high-voltage leads on his automobile distributor head. Plenty of insulation is necessary.

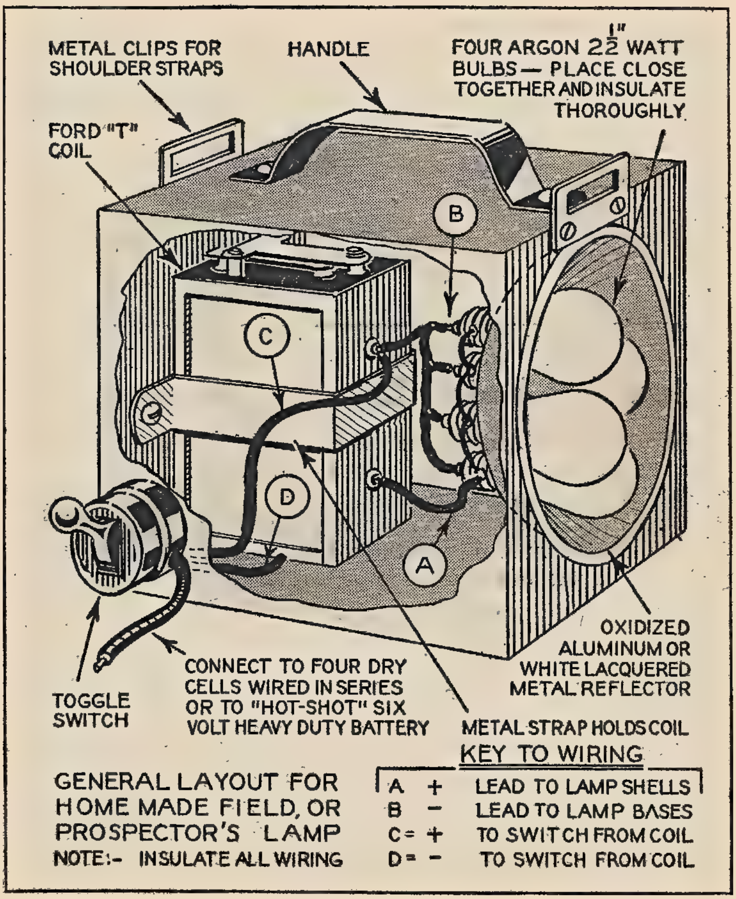
The argon glow bulb works equally well on ordinary 11-volt house current, d.c. or a.c. It is handy also for exhibiting your collection of fluorescent minerals. A bright reflector will help in directing the rays where desired. The shinest looking material is not necessarily the best mirror for the very short ultraviolet rays. Aluminum is an excellent material, and strangely, oxidized aluminum reflects more ultraviolet than the polished kind. Ordinary aluminum paint, however, is not bright, and unless your paint is a very bright sprayed aluminum, a pure white lacquer is better.

If you'd rather do your night prospecting by daylight, you can utilize the sun's ultraviolet. Fit a light cardboard box with a black cloth big enough to drape around your shoulders and keep out the light, except what is allowed to come through a No. 587 filter glass fastened over a hole in the top. Fasten the flaps of the open side so you can put specimens inside and look at them under the filtered sunlight. This "solariscope" viewing box will not work with scheelite or certain other ores requiring very short rays, as the earth's at-

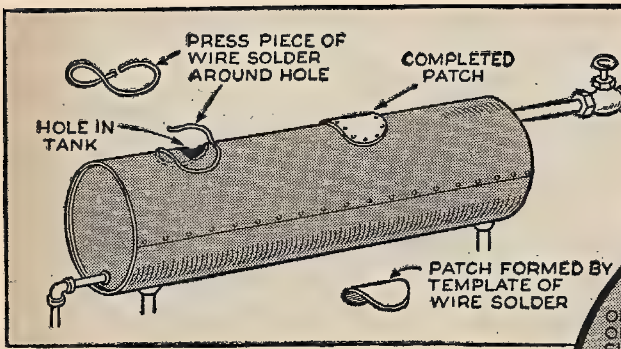
[*Continued on page* 156]


WEBBING
HOT-SHOT BATTERY CARRIED THUS FOR PORTABLE FIELD UNIT

A cluster of four argon bulbs form the black light element of this easily made portable lamp. Oxidized aluminum makes the best reflector for ultraviolet light—polished or bright materials are not as good. Dimensions are not given as box can be made to suit.


METAL CLIPS FOR SHOULDER STRAPS
HANDLE
FOUR ARGON 2½ WATT BULBS — PLACE CLOSE TOGETHER AND INSULATE THOROUGHLY
FORD "T" COIL
B
C
D
A
TOGGLE SWITCH
CONNECT TO FOUR DRY CELLS WIRED IN SERIES OR TO "HOT-SHOT" SIX VOLT HEAVY DUTY BATTERY
OXIDIZED ALUMINUM OR WHITE LACQUERED METAL REFLECTOR
METAL STRAP HOLDS COIL
GENERAL LAYOUT FOR HOME MADE FIELD, OR PROSPECTOR'S LAMP
NOTE:- INSULATE ALL WIRING
KEY TO WIRING
A + LEAD TO LAMP SHELLS
B − LEAD TO LAMP BASES
C = + TO SWITCH FROM COIL
D = − TO SWITCH FROM COIL

Improve Your Shop

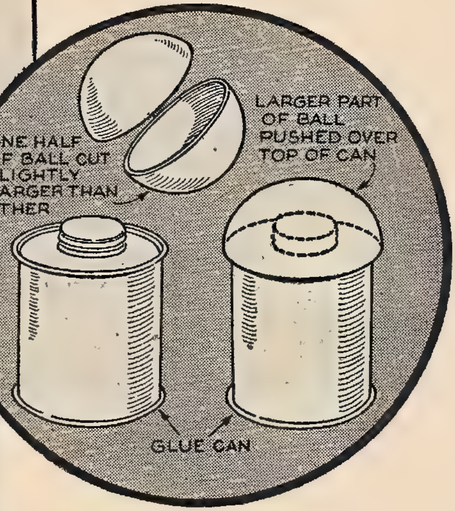

PRESS PIECE OF WIRE SOLDER AROUND HOLE
COMPLETED PATCH
HOLE IN TANK
PATCH FORMED BY TEMPLATE OF WIRE SOLDER

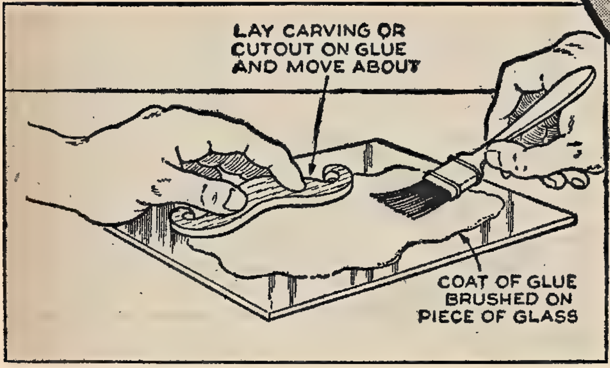
← Template Of Solder

WHEN making patches or other articles to fit irregular shapes, the ordinary type of wire solder makes good templates.

Airtight Glue Can Cover →

QUICK drying cement evaporates rapidly if the cover is loose. Half of a rubber ball makes a handy airtight safety cover.


ONE HALF OF BALL CUT SLIGHTLY LARGER THAN OTHER
LARGER PART OF BALL PUSHED OVER TOP OF CAN
GLUE CAN

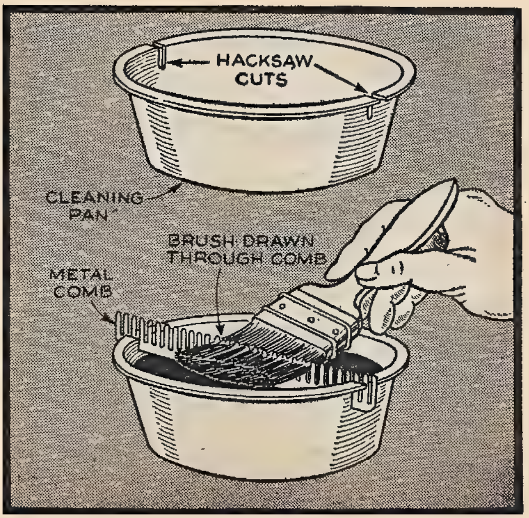

LAY CARVING OR CUTOUT ON GLUE AND MOVE ABOUT
COAT OF GLUE BRUSHED ON PIECE OF GLASS

← Gluing Carvings

WHEN scroll saw cut outs are to be glued to flat surfaces the glue often runs over the edges. If the glue is spread on glass and the work pressed down on it, surfaces coated will not run over.

Cleaning Paint Brushes →

THIS arrangement solves the brush cleaning problem very well. An ordinary metal comb is fitted into slots hacksawed in the sides of the cleaning pan. After the brush has been soaked thoroughly in the solution, draw it through the comb for complete cleaning.


HACKSAW CUTS
CLEANING PAN
BRUSH DRAWN THROUGH COMB
METAL COMB

Preserving Color Of Chestnut

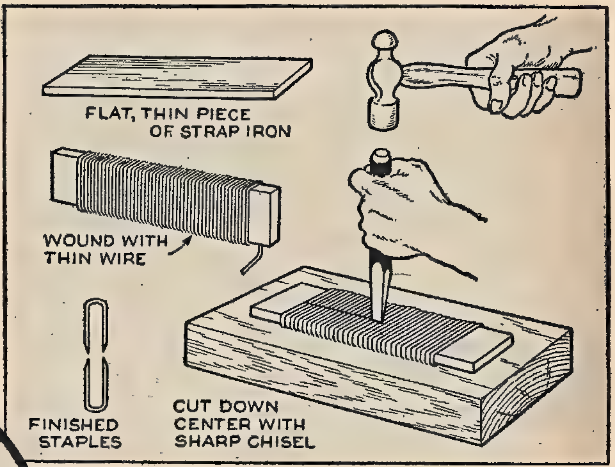
TO PRESERVE the natural color of chestnut paneling, use a protective coating of white wax or white shellac. A very thin coat of shellac followed, when dry, by a finishing coat of white wax, is recommended. Polish until the finish is as high as you desire. If you prefer a dull coat, use two thin coats of shellac, sandpapered down between coats.

Technique

by A. H. Waychoff

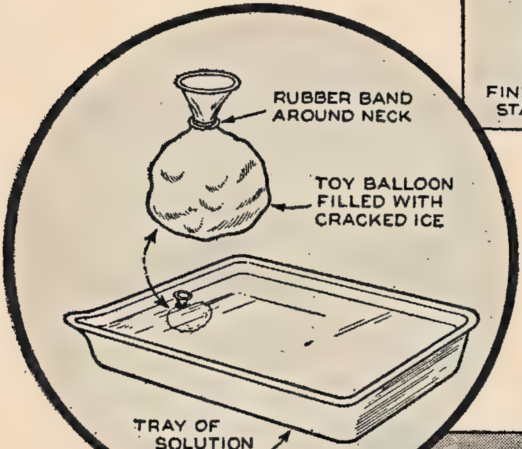
Making Staples

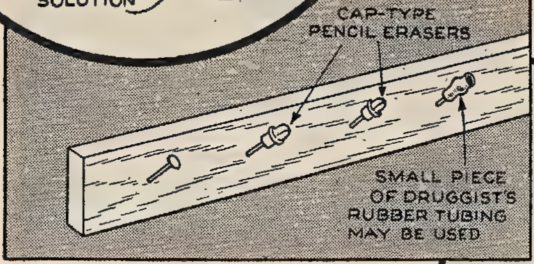
IF A particular size staple is required and none are available, this simple method will often save the day. A piece of strap iron of the proper size is wound with medium stiff iron wire as shown. A sharp cold chisel is then used as indicated to sever the windings along the center line. They must be cut on both sides, of course, and then separated for use.


FLAT, THIN PIECE OF STRAP IRON
WOUND WITH THIN WIRE
FINISHED STAPLES
CUT DOWN CENTER WITH SHARP CHISEL

Ice Bag For Photo Trays

WHENEVER it is desirable to maintain a fixed temperature in any solution that has a tendency to heat up, this device will be effective. A large toy balloon such as can be bought in the 5 and 10 cent store is used as an ice bag. Crushed ice is placed in it through the neck. The thin rubber permits the ice to cool the solution without diluting it. This is especially important in photographic work.


RUBBER BAND AROUND NECK
TOY BALLOON FILLED WITH CRACKED ICE
TRAY OF SOLUTION

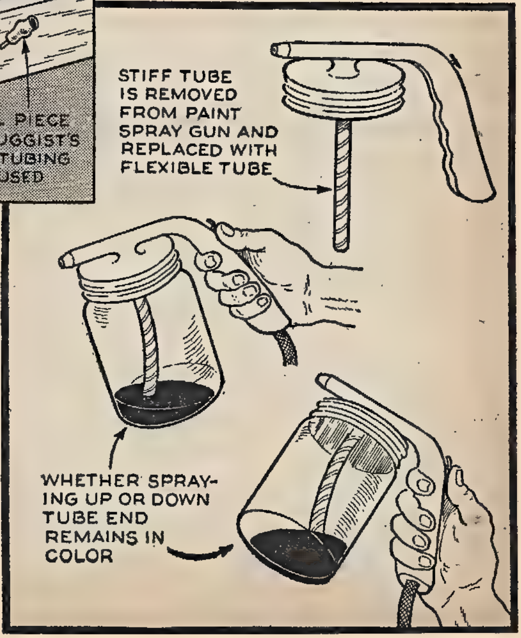

CAP-TYPE PENCIL ERASERS
SMALL PIECE OF DRUGGIST'S RUBBER TUBING MAY BE USED

Eraser-Nail Coat Hooks

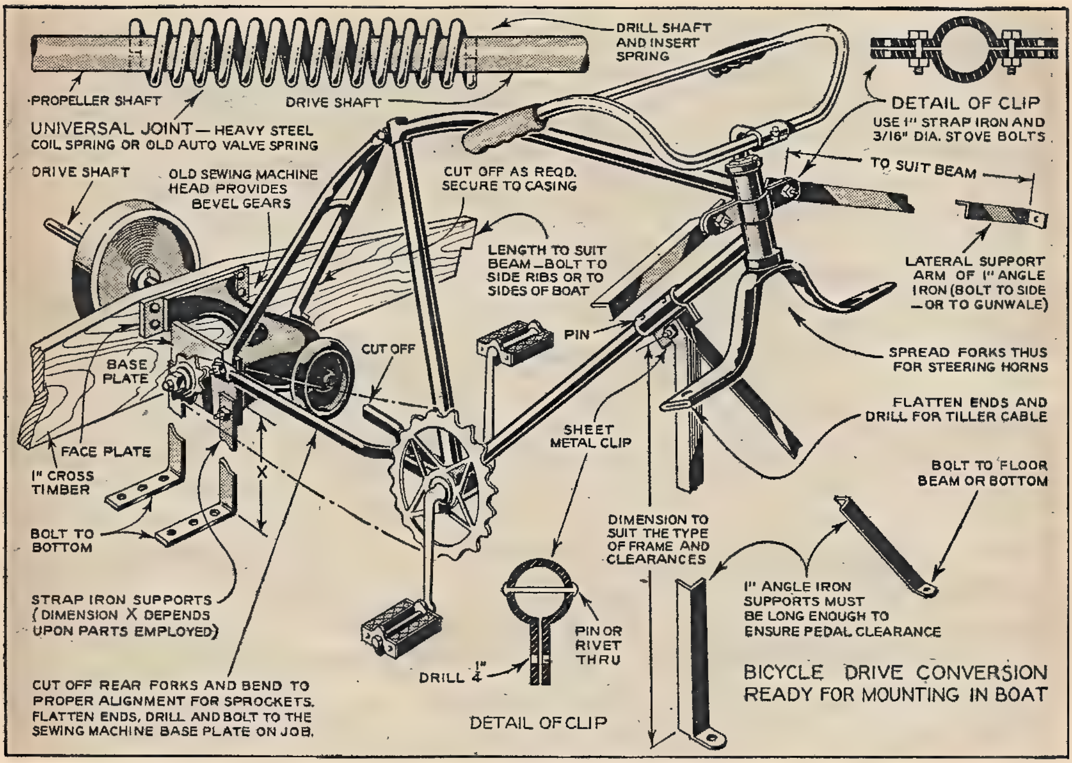
SLIP-ON type pencil erasers will prevent nails from tearing clothes that are hung on them. The erasers are simply pressed over the heads of the nails as shown.

Paint Spray Improvement

A LOW level in the paint supply jar of a spray gun often causes interruptions in the spray. A flexible rubber tube, weighted to swing to the lowest point in the jar, will use all the paint. A rigid tube won't.


STIFF TUBE IS REMOVED FROM PAINT SPRAY GUN AND REPLACED WITH FLEXIBLE TUBE
WHETHER SPRAYING UP OR DOWN TUBE END REMAINS IN COLOR

A BICYCLE DRIVE FOR YOUR ROWBOAT


DRILL SHAFT AND INSERT SPRING
PROPELLER SHAFT
DRIVE SHAFT
UNIVERSAL JOINT—HEAVY STEEL COIL SPRING OR OLD AUTO VALVE SPRING
DETAIL OF CLIP
USE 1" STRAP IRON AND 3/16" DIA. STOVE BOLTS
TO SUIT BEAM
DRIVE SHAFT
OLD SEWING MACHINE HEAD PROVIDES BEVEL GEARS
CUT OFF AS REQD. SECURE TO CASING
LENGTH TO SUIT BEAM—BOLT TO SIDE RIBS OR TO SIDES OF BOAT
LATERAL SUPPORT ARM OF 1" ANGLE IRON (BOLT TO SIDE—OR TO GUNWALE)
PIN
BASE PLATE
CUT OFF
SPREAD FORKS THUS FOR STEERING HORNS
FLATTEN ENDS AND DRILL FOR TILLER CABLE
SHEET METAL CLIP
FACE PLATE
1" CROSS TIMBER
X
BOLT TO FLOOR BEAM OR BOTTOM
BOLT TO BOTTOM
DIMENSION TO SUIT THE TYPE OF FRAME AND CLEARANCES
1" ANGLE IRON SUPPORTS MUST BE LONG ENOUGH TO ENSURE PEDAL CLEARANCE
STRAP IRON SUPPORTS (DIMENSION X DEPENDS UPON PARTS EMPLOYED)
PIN OR RIVET THRU
DRILL 1/4"
BICYCLE DRIVE CONVERSION READY FOR MOUNTING IN BOAT
CUT OFF REAR FORKS AND BEND TO PROPER ALIGNMENT FOR SPROCKETS. FLATTEN ENDS, DRILL AND BOLT TO THE SEWING MACHINE BASE PLATE ON JOB.
DETAIL OF CLIP

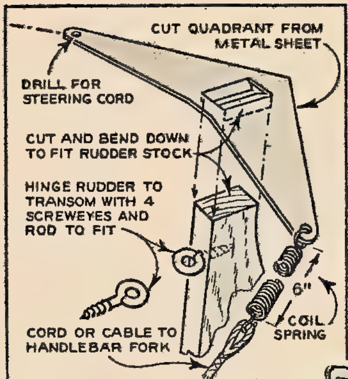
The drawing above shows the construction details of the driving mechanism for the pedal-powered boat. Note universal joint.

AN OLD bicycle, the head from a discarded sewing machine and a few odds and ends of metal will suffice to enable the home boat builder to rig up a bicycle drive for the rowboat. Many details of the construction and assembly will have to be arranged to suit the size and design of the boat and the bicycle. But, using the design and arrangements shown in the sketches as a basis, a driving unit can be put together that will propel your rowboat along at reasonable speed with no more exertion than pedaling a bicycle down Main street. The cost is little, the fuel absolutely free, and the results as good as a small outboard motor. So let's get going.

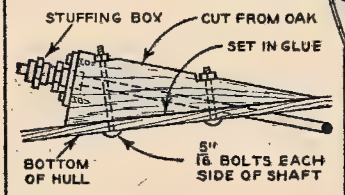
This design is suited to a boat of from ten to twelve feet in length. The lighter the construction the better. First erect the bicycle frame and line up the remainder of the assembly from that.

Strip a bicycle of its wheels, rear hub and all accessories. Sit in the boat so you will be at a point to keep the boat in trim, fore and aft and from gunwale to gunwale. Saw off the front fork about 6-in. below the spreader and spread out the tines horizontally to form the steering-bar. Then fashion a support of angle-iron to clamp solidly about the steering-head and reach across the width of the hull and bolt through each gunwale. Note that the bicycle frame must be supported high enough to allow the pedals to clear the bottom of the boat by at least 1-in. when at their lower point. Do not bolt frame down until drive shaft has been lined up. Bike will set slightly off center because of width of sewing machine head.

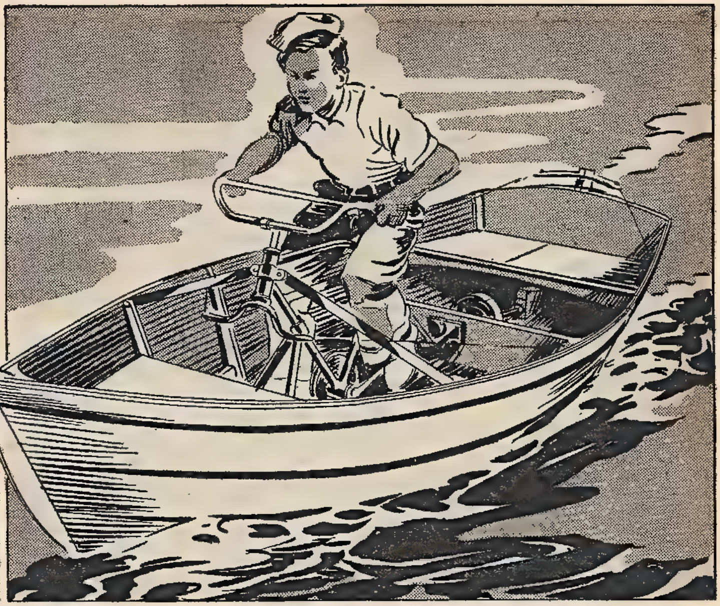
Strip the sewing machine head of all its parts and remove the bevel gears. Drill out and rearrange these on ½-in. steel shafting so they will mesh in the position shown. This

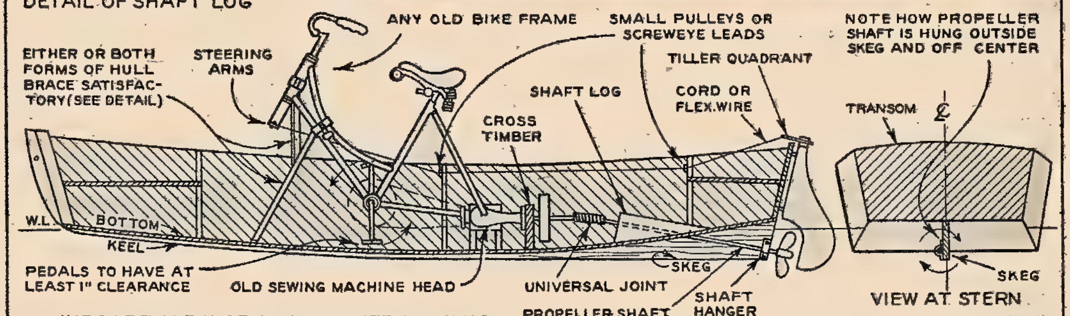

CUT QUADRANT FROM METAL SHEET
DRILL FOR STEERING CORD
CUT AND BEND DOWN TO FIT RUDDER STOCK
HINGE RUDDER TO TRANSOM WITH 4 SCREWEYES AND ROD TO FIT
6"
COIL SPRING
CORD OR CABLE TO HANDLEBAR FORK

DETAIL OF TILLER QUADRANT

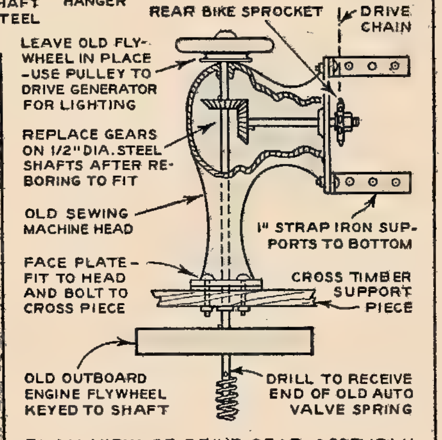

STUFFING BOX
CUT FROM OAK
SET IN GLUE
BOTTOM OF HULL
5/16" BOLTS EACH SIDE OF SHAFT

DETAIL OF SHAFT LOG




ANY OLD BIKE FRAME
SMALL PULLEYS OR SCREWEYE LEADS
NOTE HOW PROPELLER SHAFT IS HUNG OUTSIDE SKEG AND OFF CENTER
EITHER OR BOTH FORMS OF HULL BRACE SATISFACTORY (SEE DETAIL)
STEERING ARMS
TILLER QUADRANT
SHAFT LOG
CORD OR FLEX.WIRE
CROSS TIMBER
TRANSOM
℄
W.L.
BOTTOM
KEEL
SKEG
PEDALS TO HAVE AT LEAST 1" CLEARANCE
OLD SEWING MACHINE HEAD
UNIVERSAL JOINT
SHAFT HANGER
PROPELLER SHAFT OF 1/2" DIA. STEEL
SKEG
VIEW AT STERN

INBOARD VIEW OF SMALL SKIFF SHOWING GENERAL ARRANGEMENT OF INSTALLATION


REAR BIKE SPROCKET
DRIVE CHAIN
LEAVE OLD FLY-WHEEL IN PLACE -USE PULLEY TO DRIVE GENERATOR FOR LIGHTING
REPLACE GEARS ON 1/2" DIA. STEEL SHAFTS AFTER RE-BORING TO FIT
OLD SEWING MACHINE HEAD
1" STRAP IRON SUPPORTS TO BOTTOM
FACE PLATE - FIT TO HEAD AND BOLT TO CROSS PIECE
CROSS TIMBER SUPPORT PIECE
OLD OUTBOARD ENGINE FLYWHEEL KEYED TO SHAFT
DRILL TO RECEIVE END OF OLD AUTO VALVE SPRING

PLAN VIEW OF DRIVE GEAR ASSEMBLY

The installation in the boat is clearly shown in sketch above.

will allow the rear bicycle sprocket to be keyed onto the end of the vertical gear shaft and project outside the rear bicycle fork which later can be attached to the sewing machine head base. Sprocket outside makes it necessary to re-align chain drive to pedal sprocket. The other fork will have to be bolted to the machine head by drilling and tapping the latter. This arrangement places the sewing machine head on its side and the working end, which should have a face plate fitted and bolted to it (with bearing) bolts solidly to a cross timber bolted across the boat. The horizontal shaft should be sufficiently long to reach back through a hole in this timber and carry a fly-wheel and universal joint.

The flywheel is utilized to steady the propeller revolutions as well as provide latent power to assist the rider. Key or fasten these parts on in the usual manner. When all is completed as far as the universal joint; go over the assembly and line up as true as possible to remove distortion in the shafting and assure of good gear meshing and chain tension. Then grease and oil all moving parts.

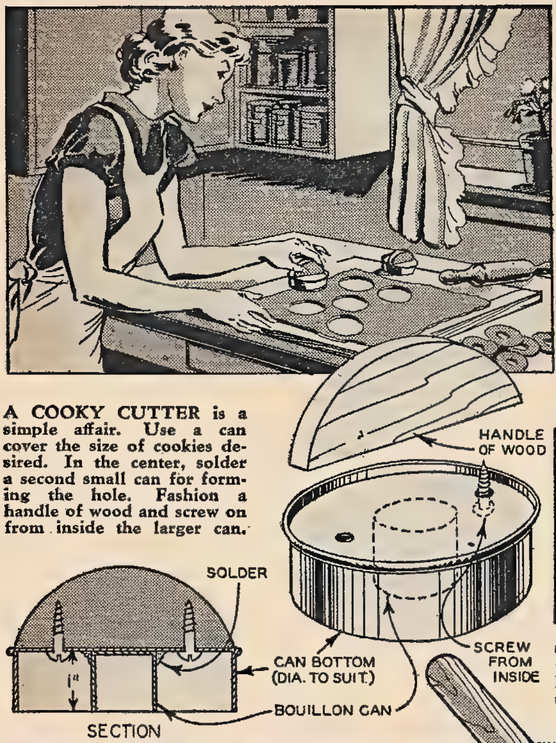
From the universal joint, run a ½-in. shaft down through a shaft-log to

[*Continued on page* 160]

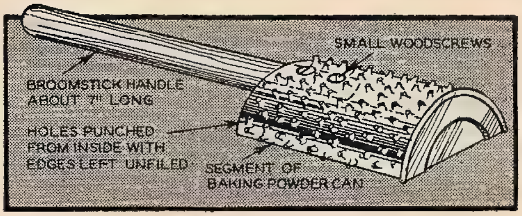
TINCAN

by L. B. Robbins

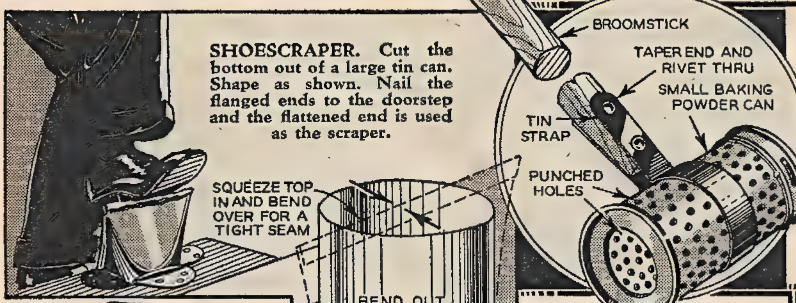
THOUSANDS upon thousands of dollars worth of tin cans are thrown away every year. Many of these cans can be redeemed and excellent use made of them about the house or in the camp. Anyone with a bit of mechanical ingenuity who is able to wield a soldering iron can do much with an empty can. The follow-


HANDLE OF WOOD
SOLDER
CAN BOTTOM (DIA. TO SUIT)
SCREW FROM INSIDE
BOUILLON CAN
1"
SECTION

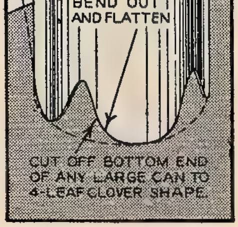
A COOKY CUTTER is a simple affair. Use a can cover the size of cookies desired. In the center, solder a second small can for forming the hole. Fashion a handle of wood and screw on from inside the larger can.


SMALL WOODSCREWS
BROOMSTICK HANDLE ABOUT 7" LONG
HOLES PUNCHED FROM INSIDE WITH EDGES LEFT UNFILED
SEGMENT OF BAKING POWDER CAN

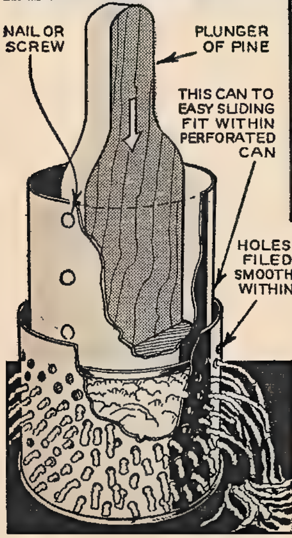
Grated cheese is a simple matter with this tin can GRATER. Cut a can in half lengthways, leaving half the bottom in place. Lay the can on a block of heavy wood and punch holes from the inside, using a large spike. Fasten a handle to one end.


BROOMSTICK
TAPER END AND RIVET THRU
SMALL BAKING POWDER CAN
TIN STRAP
PUNCHED HOLES
SQUEEZE TOP IN AND BEND OVER FOR A TIGHT SEAM

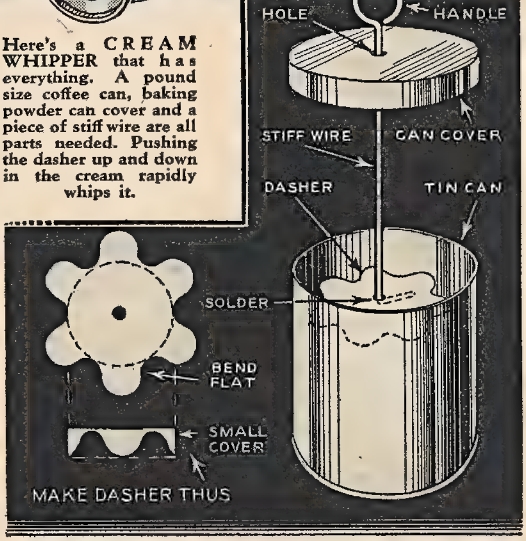
SHOESCRAPER. Cut the bottom out of a large tin can. Shape as shown. Nail the flanged ends to the doorstep and the flattened end is used as the scraper.


BEND OUT AND FLATTEN
CUT OFF BOTTOM END OF ANY LARGE CAN TO 4-LEAF CLOVER SHAPE

Soap in the dishwater is necessary. For a SHAKER use a small baking powder can. With a rounded piece of wood inside, punch the sides, bottom and cover, full of holes. Make a metal strap of other can material and fasten to a wooden handle as shown. Fill can with soap flakes or a small piece of solid soap. Swish around in the water.


NAIL OR SCREW
PLUNGER OF PINE
THIS CAN TO EASY SLIDING FIT WITHIN PERFORATED CAN
HOLES FILED SMOOTH WITHIN

Riced potatoes are easy with this RICER. Using a large spike, punch a good sized can full of holes. File off the barbs inside. Then get a slightly smaller can and fit it snugly over a wooden plunger whittled out of a piece of pine. Place the can in the bowl, put potatoes in the can and then bear down on them with the plunger. Potato shreds (riced) will squeeze out of holes.

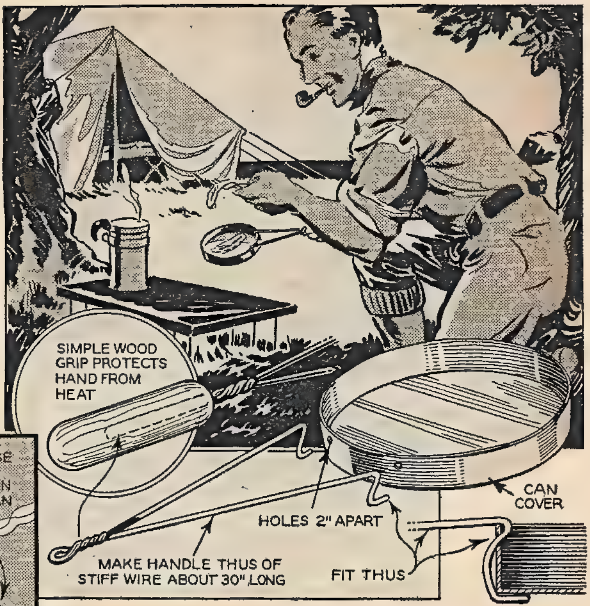

HOLE
HANDLE
STIFF WIRE
CAN COVER
DASHER
TIN CAN
SOLDER
BEND FLAT
SMALL COVER
MAKE DASHER THUS

Here's a CREAM WHIPPER that has everything. A pound size coffee can, baking powder can cover and a piece of stiff wire are all parts needed. Pushing the dasher up and down in the cream rapidly whips it.

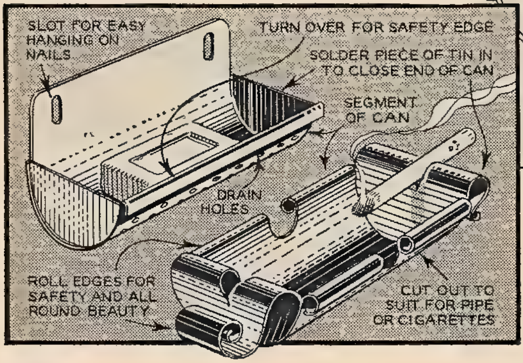
-OLOGY

Useful gadgets from old tin cans

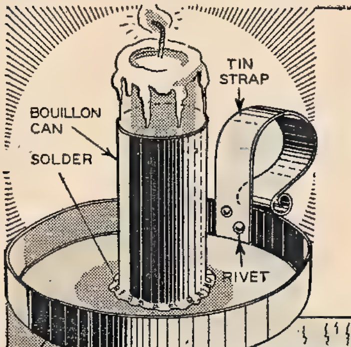
ing ideas are only a few of many possible ones. Look them over. Then get busy and make a few handy gadgets for the wife, yourself or your friends. It's fun and you'll be surprised at what can be made from an otherwise useless object.


SIMPLE WOOD GRIP PROTECTS HAND FROM HEAT
CAN COVER
HOLES 2" APART
MAKE HANDLE THUS OF STIFF WIRE ABOUT 30" LONG
FIT THUS

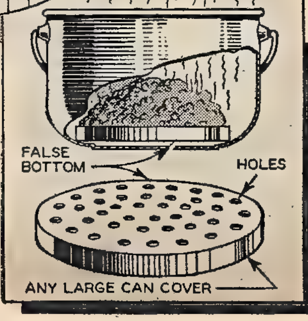
Let's make a little **FRYING PAN** for frying an egg at a time. It is only necessary to find the cover to one of those large cracker tins. Drill two holes about 2" apart near the top edge. Then attach about 30" of galvanized telephone wire for a handle as shown. Push the ends through the holes in the pan, turn the handle over and it will grab the pan nicely from below. Insulate the handle with wood. It can be quickly taken apart and stowed in the knapsack if camping.


SLOT FOR EASY HANGING ON NAILS
TURN OVER FOR SAFETY EDGE
SOLDER PIECE OF TIN IN TO CLOSE END OF CAN
SEGMENT OF CAN
DRAIN HOLES
ROLL EDGES FOR SAFETY AND ALL ROUND BEAUTY
CUT OUT TO SUIT FOR PIPE OR CIGARETTES

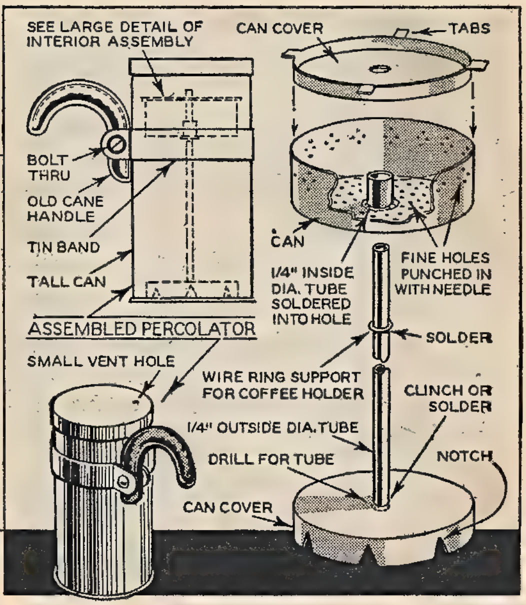
Want a good **SOAP DISH?** Cut out a suitable tin can as shown. Punch the rounded portion full of holes with a nail and make two holes in the tab to hang it up by. In much the same manner you can make an **ASH TRAY** that will also hold cigar or pipe. Cut a can in half lengthways but leave each end intact. These are then squared off and bent over for legs. Two notches act as the cigar holder.


TIN STRAP
BOUILLON CAN
SOLDER
RIVET
CAN COVER

For a **CANDLESTICK** look at the sketch. It's so simple it's funny. Simply saw off a section of a bullion cube can, scrape the bottom and solder it to the center of an overturned can cover for the base. By decorating it, you can show your friends a fair sample of clever handcraft.


FALSE BOTTOM
HOLES
ANY LARGE CAN COVER

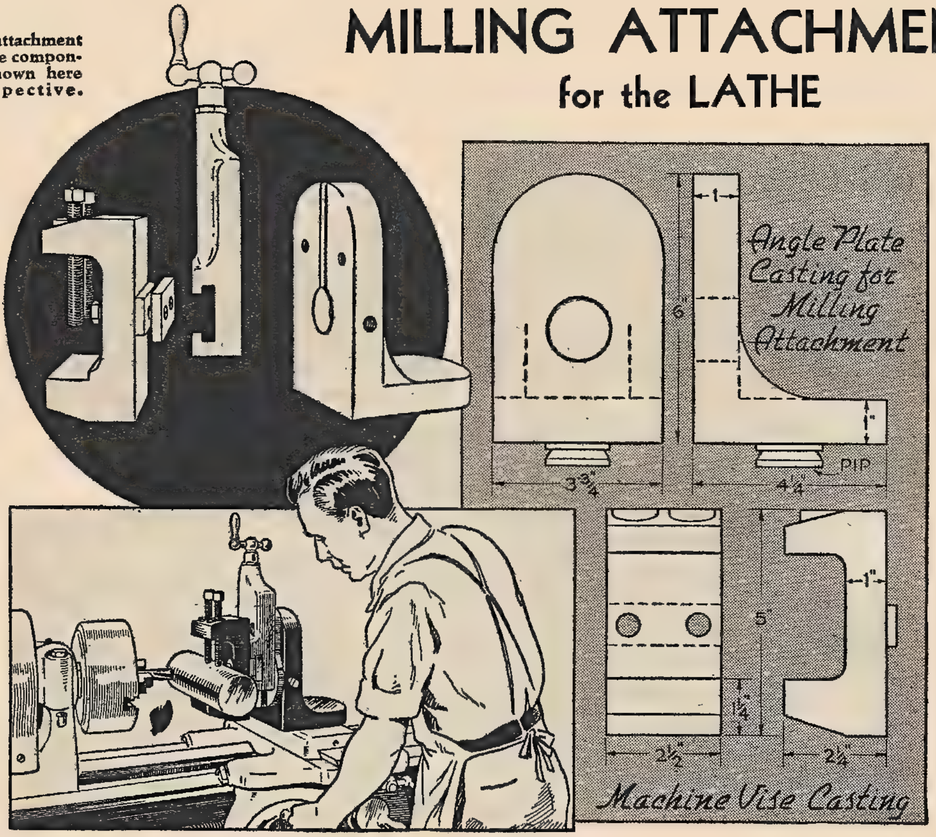
To prevent vegetables, etc., from burning on the bottom of a kettle place a large can cover in the bottom as shown. Punch this cover full of holes. When the water boils away the vegetables will rest on the cover top instead of the kettle bottom, thus eliminating a burned dinner.


SEE LARGE DETAIL OF INTERIOR ASSEMBLY
CAN COVER
TABS
BOLT THRU
OLD CANE HANDLE
TIN BAND
TALL CAN
ASSEMBLED PERCOLATOR
CAN
FINE HOLES PUNCHED IN WITH NEEDLE
1/4" INSIDE DIA. TUBE SOLDERED INTO HOLE
SOLDER
SMALL VENT HOLE
WIRE RING SUPPORT FOR COFFEE HOLDER
CLINCH OR SOLDER
1/4" OUTSIDE DIA. TUBE
DRILL FOR TUBE
NOTCH
CAN COVER

Our final and crowning project is a **COFFEE PERCOLATOR.** Use a large, tall can for the bottom. Make a wide band of tin to strap around the middle, and add a handle, as shown. The in'ards consist of a smaller can cover into which is soldered the end of a piece of ¼" metal tubing slightly shorter than the "urn." Choose a short can and cover for the ground coffee. With a needle awl punch the bottom *full* of small holes. Make a hole in the center of the cover to fit over the long tube and cut four tabs around the edge. Solder a wire ring on the tube.

MILLING ATTACHMENT for the LATHE

The attachment has three components, shown here in perspective.



by W. D. Slocombe

MANY hobbyists purchase their lathes and then find that they require various attachments before being able to complete the project they are contemplating. Much experience in tool making, not to speak of pleasure and real satisfaction may be had by constructing lathe accessories such as the milling attachment described here.

The back-geared metal-turning lathe is well named "The King of Tools," and if equipped with a milling attachment puts its owner into position to do an endless variety of machine work. This accessory, while fairly expensive to buy, can be made at low cost.

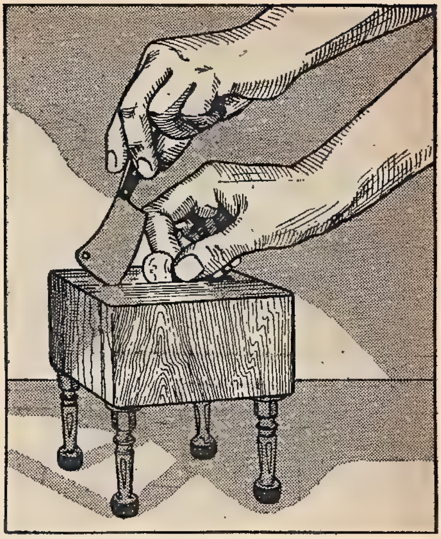
A milling attachment for a lathe consists primarily of an angle-plate for attachment to the cross-slide. This is provided with a device to vertically raise and lower a machine vise in which the article to be milled is held. The vertical movement should also be adjustable to any angle between the vertical and horizontal. We first proceed to construct a strong angle plate, as shown. It is a straight forward pattern-making job made out of 1" lumber to give the finished article real rigidity. It is 6" high, has a base 4¼" long and 3¾" wide. It should be very sturdily braced at the bottom inside angle with a good filet as illustrated.

Most standard lathes have a center hole in the cross-slide of the compound rest into which the top slide fits and is secured by two set screws gripping on a pip similar to that shown on base of angle plate. Therefore a print of sufficient size to provide metal for machining this pip should be provided on the base of this pattern.

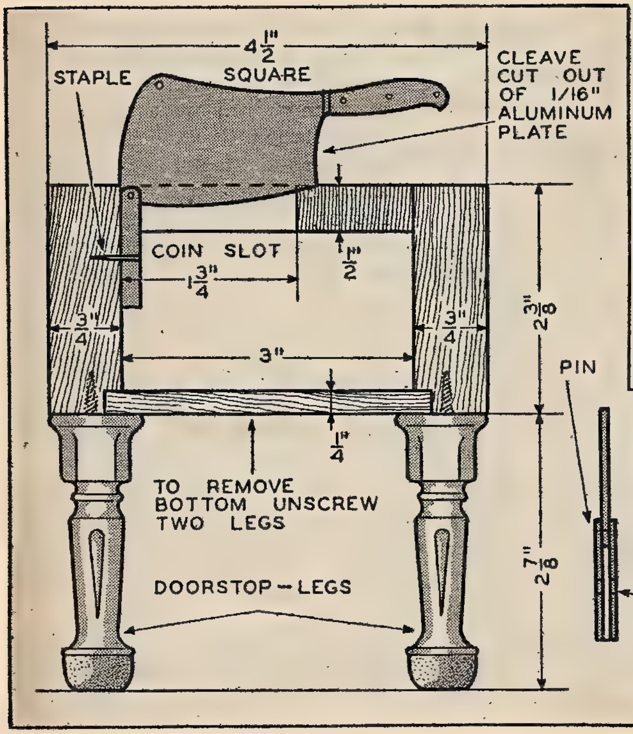
When the angle plate casting is ready it can be machined easily on the lathe by means of a simple jig. This consists of a piece of ¾" round stock 9" long screwed into a small circular flange which in turn is attached to the inside of the vertical side of the angle plate by three machine screws. The round stock is then held in the chuck, allowing easy facing of the large face of the angle plate. This machining operation should be done with lathe in back-gear to offset uneven weight of casting. After facing has been completed remove jig and discard.

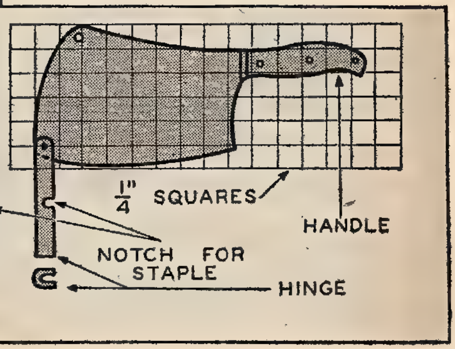
[*Continued on page* 158]

Children Will Save With This Butcher Block Bank

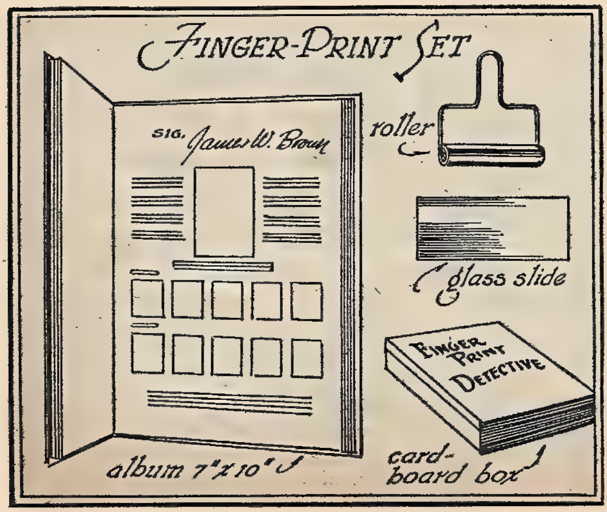


The drawing below shows the details of the block bank.


4 1/2" SQUARE
STAPLE
CLEAVE CUT OUT OF 1/16" ALUMINUM PLATE
COIN SLOT
1 3/4"
1/2"
3/4"
3"
3/4"
2 3/8"
1/4"
TO REMOVE BOTTOM UNSCREW TWO LEGS
DOORSTOP—LEGS
2 7/8"
PIN

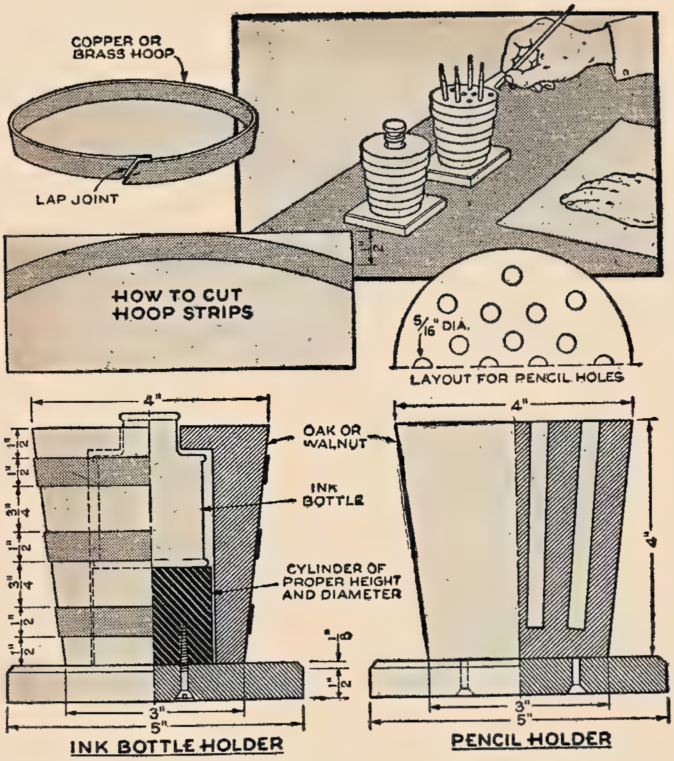

1/4" SQUARES
HANDLE
NOTCH FOR STAPLE
HINGE

ALTHOUGH almost any kind of wood may be used satisfactorily in this child's novel bank, maple makes the most attractive job. The parts are glued together as illustrated, with a good grade of waterproof glue. The butcher's cleaver is cut from sheet aluminum. The handle of the tiny tool is made of two pieces of stained wood, cemented to the sides. The cleaver is pivoted as shown, acting as a cover for the slot through which the coins are inserted. The legs are simply doorstops, or "bumpers." These can be obtained for a few cents from the local hardware store. The wooden parts should be finished with clear shellac or varnish, and waxed to produce a lustre.—*A. O.*


FINGER-PRINT SET
SIG. James W. Brown
roller
glass slide
FINGER PRINT DETECTIVE
album 7"x10"
card-board box

Finger-print Set For the Home

THIS simple finger-printing set will provide much amusement. The "gallery" consists of an ordinary photographic album, with pages divided for fingers as shown. A glass plate about 3"x7" holds the ink. Printers' ink is used, rolled out with the roller. The roller is made from a 2" long dowel covered with rubber tubing. The handle is of wire. Use little ink, and clean hands with benzine.—*G. E. V. H.*


COPPER OR BRASS HOOP
LAP JOINT
HOW TO CUT HOOP STRIPS
1/4
5/16" DIA.
LAYOUT FOR PENCIL HOLES
4"
1/2
1/2
3/4
1/2
3/4
1/2
1/2
OAK OR WALNUT
INK BOTTLE
CYLINDER OF PROPER HEIGHT AND DIAMETER
1/8
1/2
3"
5"
INK BOTTLE HOLDER
4"
4"
3"
5"
PENCIL HOLDER

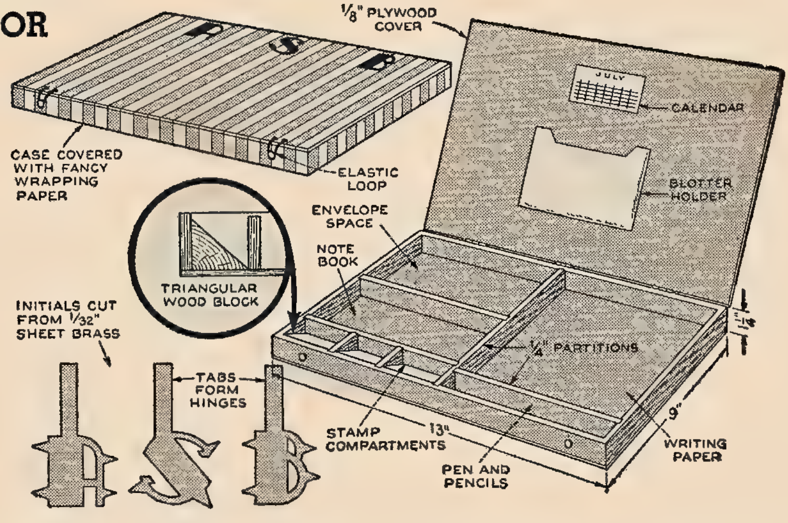
OAKEN BUCKET DESK SET

THESE two buckets sit on the desk. One holds pencils and a pen or two. The other is hollow and drops down over the ink bottle. Both are lathe turnings and may be finished either plain or trimmed in wide copper or brass hoops.

Use solid blocks and turn the buckets to a top diameter of 4 inches, a bottom diameter of 3 inches, with a height of 4 inches. Bore a number of holes as shown. Sand the outside and top well, then finish in the usual manner with lacquer or shellac.

Cut the base 5/8 inch thick with a 1/8 inch chamfer, finish to match the bucket, then fasten the two parts together with a couple of screws. Oak, walnut or other hard wood may be used. *D. V. H.*

PAPERED CASE FOR STATIONERY


1/8" PLYWOOD COVER
JULY
CALENDAR
CASE COVERED WITH FANCY WRAPPING PAPER
ELASTIC LOOP
BLOTTER HOLDER
ENVELOPE SPACE
NOTE BOOK
TRIANGULAR WOOD BLOCK
INITIALS CUT FROM 1/32" SHEET BRASS
TABS FORM HINGES
1/4" PARTITIONS
1 1/4
STAMP COMPARTMENTS
13"
9"
WRITING PAPER
PEN AND PENCILS

THIS correspondence case is 9"x 13"x1¼", plenty large enough to write on. The bottom and the lid are of ⅛" plywood. The sides and partitions are of ¼" birch. It is covered with striped wallpaper and lined with a solid color paper to match. After the paper is rubber cemented in place the box is lacquered inside and out to prevent the paper becoming soiled or scuffed.

The hinges are cut from brass sheeting about 1/32" thick, and the part of each hinge that lies on the lid is cut to form one initial of the box's owner. Two hinges are enough should there be only two initials. The box is held closed by two loops of round silk-covered elastic which snap over upholsterer's nails set in the front.

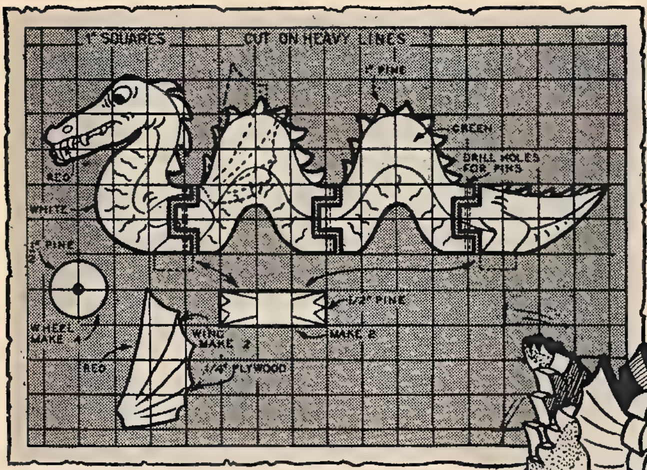
In order to stand wear and handling, the box is made as strong as the light material permits. The corners are dovetailed and glued, and the partitions are dadoed into each other and into the sides and glued.

The bottom is fastened on with light flathead screws countersunk flush. These screws are placed not only in the front, back and sides, but in all the partition pieces as well.

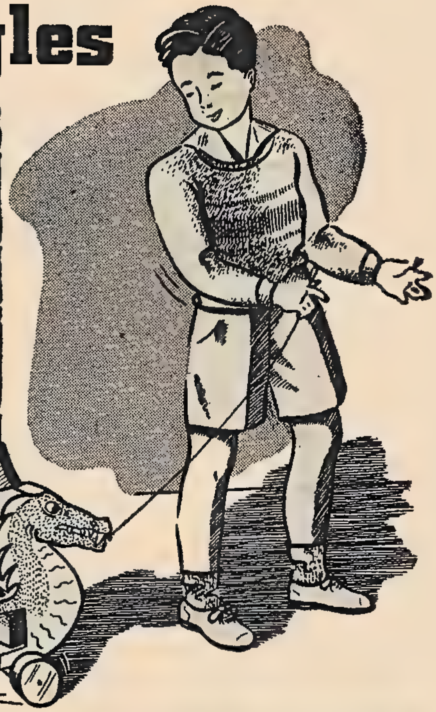
The box contains writing paper, envelopes, date-book, pencil, fountain-pen, and stamps in three denominations—1c, 2c, and 3c. Each

[*Continued on page* 160]

Toy Dragon Wiggles


1" SQUARES
CUT ON HEAVY LINES
1" PINE
GREEN
DRILL HOLES FOR PINS
RED
WHITE
1" PINE
WHEEL MAKE 4
WING MAKE 2
1/2" PINE
MAKE 2
RED
1/4" PLYWOOD

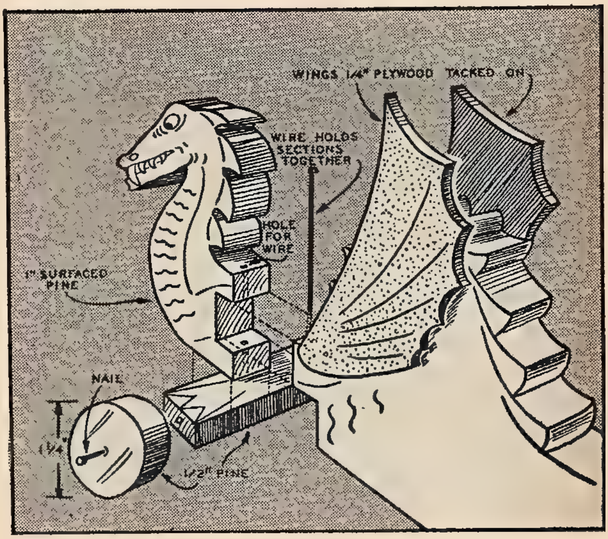
The squared drawing above will enable the workshop enthusiast to duplicate the exact form of the dragon. Plywood or heavy cardboard is used for the wings.



THIS winged monster is sure to amuse any child. Being jointed and having the wheels on the front and rear sections, it wiggles realistically back and forth as it is pulled along. The sections of the dragon are cut from 1″ surfaced pine.

The axles, or feet and the wheels should be cut from ½″ stock. The two wings are cut from ¼″ plywood, being shaped with a jig saw. A ⅛″ hole is drilled where the sections of the dragon come together and a wire slipped through and bent at each end to hold the joints together. The hole must be large enough to allow the joints to work freely.

Nail the feet to the first and last sections and then drill a ⅛″ hole carefully through the center of each wheel, and attach one to each end of the feet with a nail. Be sure the holes of the wheels are true.


WINGS 1/4" PLYWOOD TACKED ON
WIRE HOLDS SECTIONS TOGETHER
HOLE FOR WIRE
1" SURFACED PINE
NAIL
1 1/4"
1/2" PINE

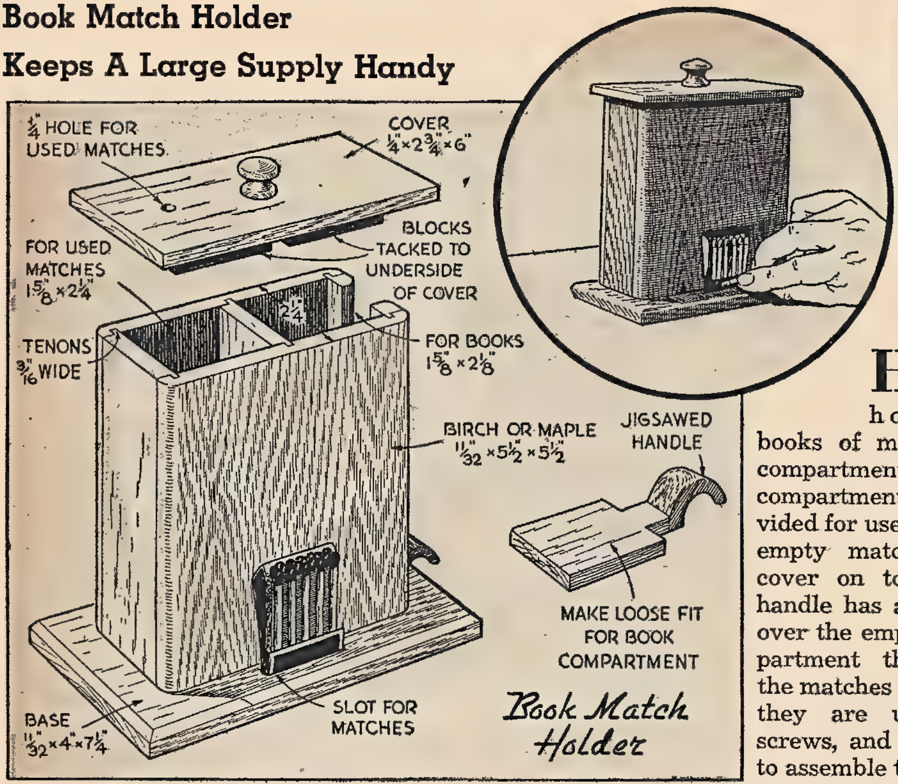
The drawing above shows the joint assembly of the toy. Pivots are wire.

The wings are then tacked one on each side of the second section, and a screw eye fixed in the mouth to which a string may be tied. Paint the entire toy with shiny enamel in many bright colors.

Large glass headed pins may be cut off to about the length of a tack, and inserted in the sides of the dragon's head to form the eyes. If any old celluloid golf tees are available, their stems may be cut into about three pieces each and glued to the sides of the mouth. These make very realistic teeth. Several full length tee stems can also be cemented under the front of the nose and chin of the toy to give the appearance of tusks.

Allow plenty of clearance space in the joints of the body to prevent it from sticking in any one position. Flat headed nails should be used to fasten the wheels in place, so axle holes can be large enough to turn freely without having wheels come off.—*R. L. Fairall.*

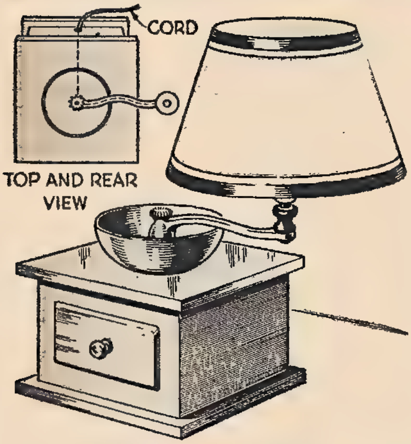
Book Match Holder Keeps A Large Supply Handy


1/4" HOLE FOR USED MATCHES
COVER 1/4"×2 3/4"×6"
BLOCKS TACKED TO UNDERSIDE OF COVER
FOR USED MATCHES 1 5/8"×2 1/4"
2 1/4"
TENONS 3/16" WIDE
FOR BOOKS 1 5/8"×2 1/8"
BIRCH OR MAPLE 11/32"×5 1/2"×5 1/2"
JIGSAWED HANDLE
MAKE LOOSE FIT FOR BOOK COMPARTMENT
SLOT FOR MATCHES
BASE 11/32"×4"×7 1/4"
Book Match Holder

These easily-made novelties will add a quaint touch to the home. Two old-fashioned lamps and a modern style holder for book matches.

HERE is a container that holds fifteen books of matches in one compartment. In another compartment space is provided for used matches and empty match books. A cover on top with knob handle has a ¼-inch hole over the empty book compartment through which the matches are dropped as they are used. Nails, screws, and glue are used to assemble the parts. The match book lifter's handle protrudes from the end slot. On the side is another slot which holds an open pack of matches for current use, as shown in circle.—*D.V.H.*

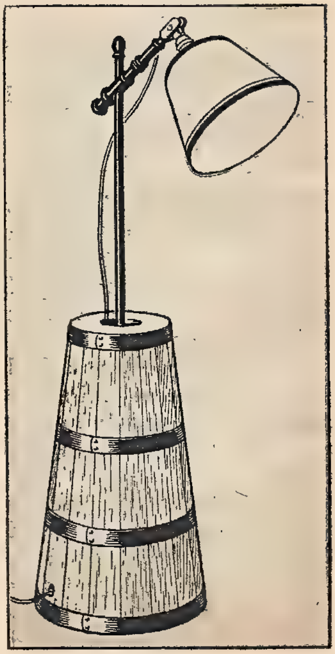
Coffee Grinder Table Lamp

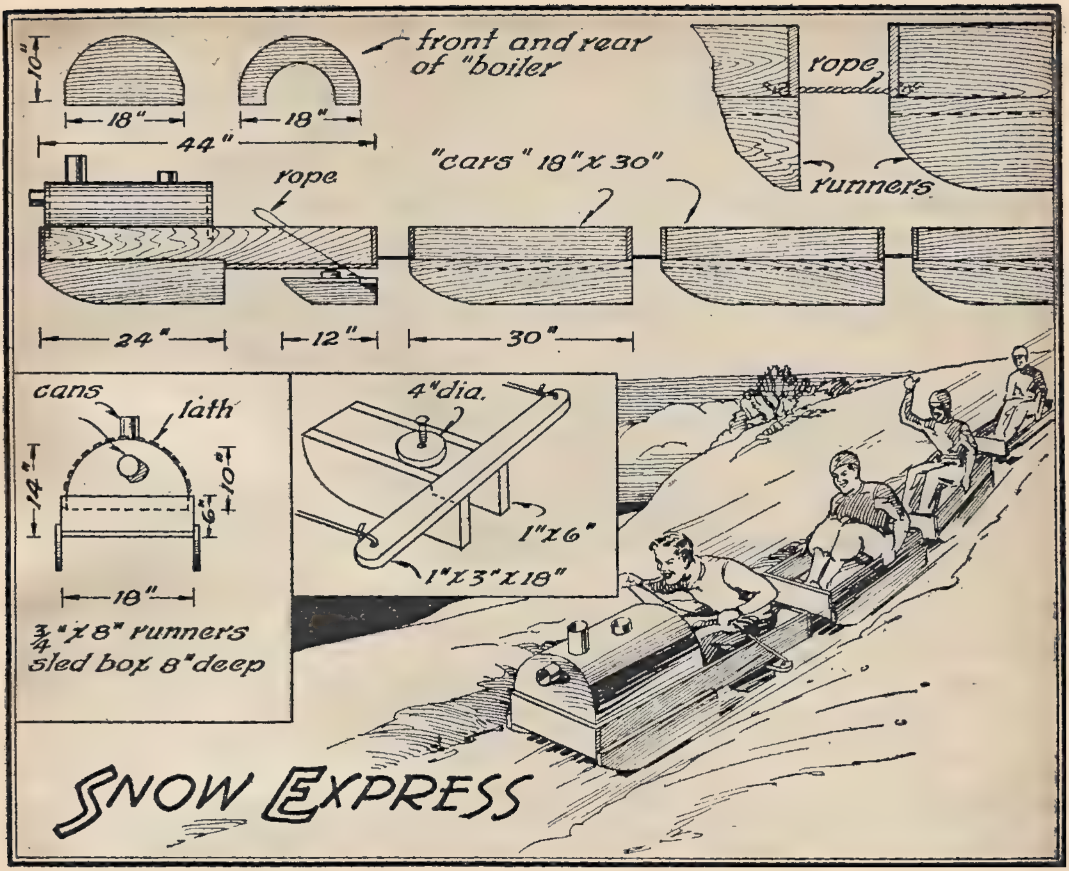

CORD
TOP AND REAR VIEW

THIS lamp, made from an old coffee grinder, will enhance the beauty of any room furnished in antique style. A hole is bored in the base of the grinder, and the lamp cord run through it to another hole in the top. The cord is then led along the under side of the handle to the knob on the end. The bulb socket is mounted in place of the knob. The little drawer, originally intended for the storage of the whole coffee beans, makes an ideal place to keep little household accessories.

Floor Lamp From Old Butter Churn

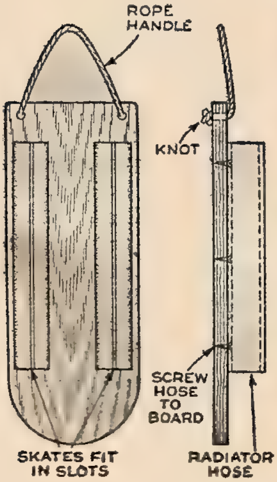
OLD butter churns, which are available very cheaply in most rural sections, can easily be made into attractive floor lamps. The churn handle supports the lamp. The cord enters the base through a small hole bored for the purpose. The lid of the churn base can be lifted when necessary, and various articles stored in the lamp base.—*Adelaide Blanton.*

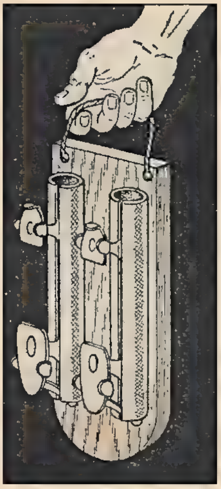



10"
18"
18"
front and rear of "boiler"
44"
rope
"cars" 18"x30"
rope
runners
24"
12"
30"
cans
lath
14"
10"
6"
18"
¾"x8" runners
sled box 8" deep
4"dia.
1"x6"
1"x3"x18"
SNOW EXPRESS

Ice Skate Holders ↓

AUTO radiator hose, slit lengthwise and tacked to a wooden base board, makes an efficient ice skate holder. The runners are inserted into the slits. The nails holding the hose are covered with tape.—*L. B. R.*


ROPE HANDLE
KNOT
SCREW HOSE TO BOARD
SKATES FIT IN SLOTS
RADIATOR HOSE

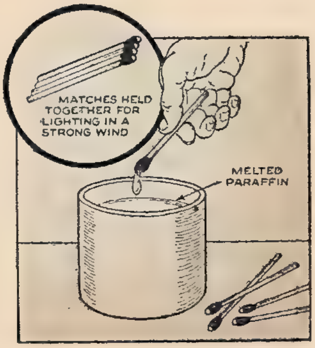


Snow Express ↑

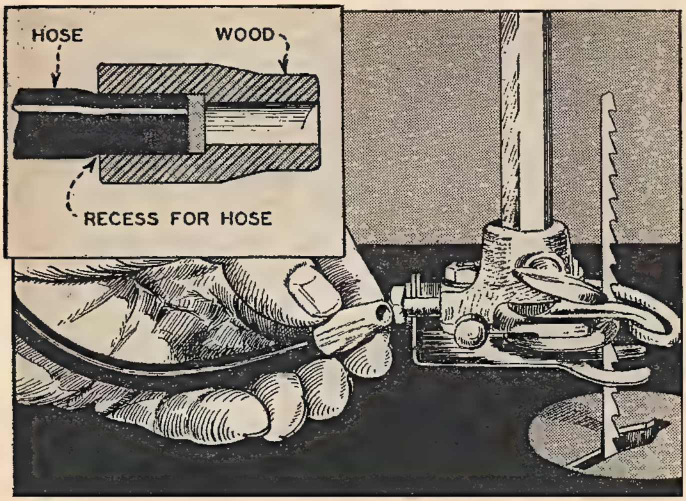
THIS realistic locomotive sled can easily be built from cheap ¾" planks of the dimensions shown. The semi-circular ends of the "boiler" support laths covered with tar paper. The smoke stack and headlight are tin cans. The chassis of the locomotive and the cars are boxes 8" deep, to the bottom of which the runners are attached. The rear engine runner steers by rope.—*G. E. V. H.*

Windy Matches

FRICTION matches dipped in melted paraffin and pressed together as shown, will light in wind and rain. Water does not spoil them.—*C. B.*


MATCHES HELD TOGETHER FOR LIGHTING IN A STRONG WIND
MELTED PARAFFIN

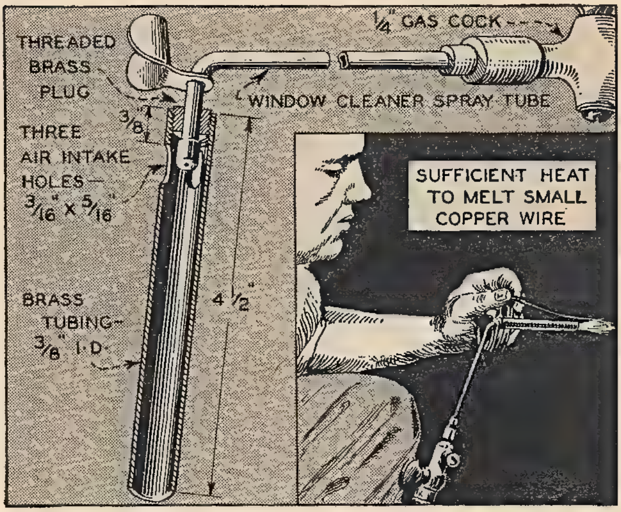
Wooden Tips For Blower Hose


HOSE
WOOD
RECESS FOR HOSE

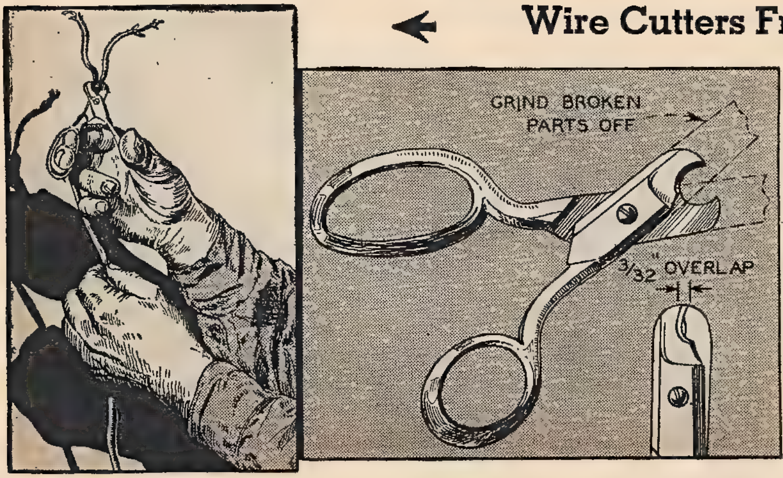
THE rubber tubing that carries the air to the saw table of many power saws frequently splits. When this happens it is usually necessary to repair it immediately to prevent it from blowing the sawdust in the eyes of the worker. This repair job usually consists of cutting off the split end of the tube and slipping it back on the fitting again. If this is repeated too often the hose becomes too short and must be replaced. To prevent this from happening, it is advisable to fit the tube with a wooden tip as shown. This will prevent it from splitting at the end. It may be bored and whittled.—*E. M. L.*

Old Window Spray Makes Blowtorch

AN OLD window spray of the type frequently fitted to bottles of the cleaning solution can be made into an efficient blowtorch. The tube, with its fine spray jet hole is fitted into a 4½″ length of ⅜″ inside diameter brass tubing. Holes are cut to admit air, as shown in the drawing. The end of the spray tube is attached to the gas line, and a valve provided near the connection. The air holes must be of the size indicated on the drawing to provide the correct mixture.—*E. M. L.*


THREADED BRASS PLUG
¼″ GAS COCK
WINDOW CLEANER SPRAY TUBE
⅜″
THREE AIR INTAKE HOLES—3/16″ x 5/16″
4½″
BRASS TUBING—⅜″ I.D.
SUFFICIENT HEAT TO MELT SMALL COPPER WIRE

Wire Cutters From Old Scissors


GRIND BROKEN PARTS OFF
3/32″ OVERLAP

THESE inexpensive wire cutters will be a great aid around the shop. They are ground from a broken pair of scissors. Care must be taken in grinding, to provide the overlap indicated. If this is not provided the cutters will not be effective. Be sure also to grind to the "hook" shape shown, to prevent slipping.—*E. M. L.*

Addresses Of Manufacturers Of The Prizes In The MECHANIX ILLUSTRATED CONTEST

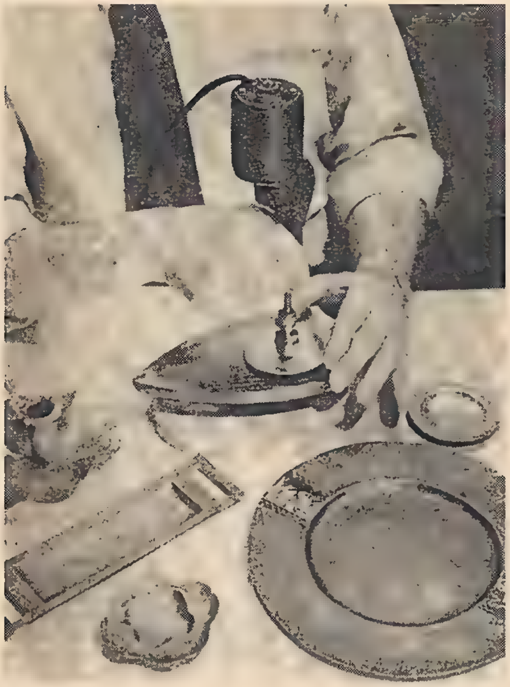
1	Taylorcraft Aviation Corp.	Alliance, Ohio
2	Indian Motocycle Co.	Springfield, Mass.
3	Atlas Press Co.	Alliance, Michigan
4	J. C. Deagan, Inc.	Chicago
5	Midwest Radio Corp.	Cincinnati
6	Gruen Watch Co.	Cincinnati
7	Fisher Research Laboratories	Palo Alto, Calif.
8	Penn Yan Boats, Inc.	Penn Yan, New York
9	Briggs & Stratton Corp.	Milwaukee
10	Mead Gliders	Chicago
11	Allied Radio Corp.	Chicago
12	Skilsaw, Inc.	Chicago
13	The Hallicrafters	Chicago
14	Evinrude Motors	Milwaukee
15	Murray Ohio Mfg. Co.	Cleveland
16	Westfield Mfg. Co.	Westfield, Mass.
17	Marlin Firearms Co.	New Haven, Conn.
18	Burke & James Corp.	Chicago
19	O. F. Mossberg & Sons, Inc.	New Haven, Conn.
20	Zenith Radio Corp.	Chicago
21	Delta Mfg. Co.	Milwaukee, Wis.
22	Foredom Electric Co.	New York, N. Y.
23	Enterprise Mfg. Co.	Akron, Ohio
24	Stanley Works	New Britain, Conn.
25	Dremel Mfg. Co. (Moto-Tool Kit)	Racine, Wis.
26	General Electric Co.	Bridgeport, Conn.
27	Iver Johnson Arms & Cycle Works	Fitchburg, Mass.
28	Federal Stamping & Engineering Corp.	Brooklyn, N. Y.
29	General Electric Co.	Schenectady, N. Y.
30	Bausch & Lomb Optical Co.	Rochester, N. Y.
31	S. L. Allen & Co., Inc.	Philadelphia, Pa.
32	RCA Mfg. Co.	Camden, N. J.
33	Boice Crane Co.	Toledo, Ohio
34	Hein Werner Motor Parts Corp.	Waukesha, Wis.
35	Galvin Mfg. Corp.	Chicago
36	W. A. Sheaffer Pen Co.	Fort Madison, Iowa
37	Remington Rand, Inc.	Bridgeport, Conn.
38	Wilson Sporting Goods Co.	New York, N. Y.
39	Wilcox-Crittenden & Co.	Middletown, Conn.
40	Kalart Company (Flash Gun No. 1)	New York, N. Y.
41	Casco Products Corp.	Bridgeport, Conn.
42	Blackhawk Mfg. Co.	Milwaukee
43	J. B. Williams Co.	Glastonbury, Conn.
44	A. C. Gilbert Co.	New Haven, Conn.
45	Kalart Company (Flash Gun No. 2)	New York, N. Y.
46	Alaska Sleeping Bag Co.	Portland, Ore.
47	Chicago Wheel & Mfg. Co. (De Luxe Handee Tool)	Chicago
48	Chicago Wheel & Mfg. Co. (De Luxe Artizan Tool)	Chicago
49	Art Metal Works, Inc.	Newark, N. J.
50	K-D Lamp Co.	Cincinnati
51	Leon A. Axel, Ltd.	New York, N. Y.
52	DeJur-Amsco Corp.	Shelton, Conn.
53	Utica Duxbak Corp.	Utica, N. Y.
54	G-M Laboratories, Inc.	Chicago
55	Kirsten Pipe Co. (Kirsten Pipe)	Seattle, Wash.
56	Benjamin Air Rifle Co.	St. Louis, Mo.
57	American Chain and Cable Co., Inc.	York, Pa.
58	Junior Motors Corp.	Philadelphia
59	GHQ Motors, Inc. (2 Motors)	New York, N. Y.
60	GHQ Motors, Inc.	New York, N. Y.
61	Comet Model Airplane & Supply Co.	Chicago
62	Albert Specialty Company	Chicago
63	Kaywoodie Company	New York, N. Y.
64	Polaroid Corporation	Cambridge, Mass.
65	GHQ Motors, Inc. } (3 Motor Kits)	New York, N. Y.
66	GHQ Motors, Inc.	
67	GHQ Motors, Inc.	
68	Haines Products	New York, N. Y.
69	Dremel Mfg. Company (Moto-Saw)	Racine, Wis.
70	Boyce Meier Equipment Co.	Bronxville, N. Y.
71	Hull Mfg. Company (Auto Compass)	Warren, Ohio
72	Daisy Mfg. Co.	Plymouth, Mich.
73	Kumfy Products, Inc.	Cincinnati
74	Kirsten Pipe Co. (Cigarette Holder)	Seattle, Wash.
75	Hull Mfg. Co. (Campers' Compass)	Plymouth, Mich.

Note: All blueprints by MECHANIX ILLUSTRATED and HOW TO BUILD 20 BOATS

New Ideas for Home & Shop

Names and addresses of manufacturers of products described below will be sent free to any reader on request, provided a stamped, return envelope accompanies the inquiry. Mention date of issue when writing.

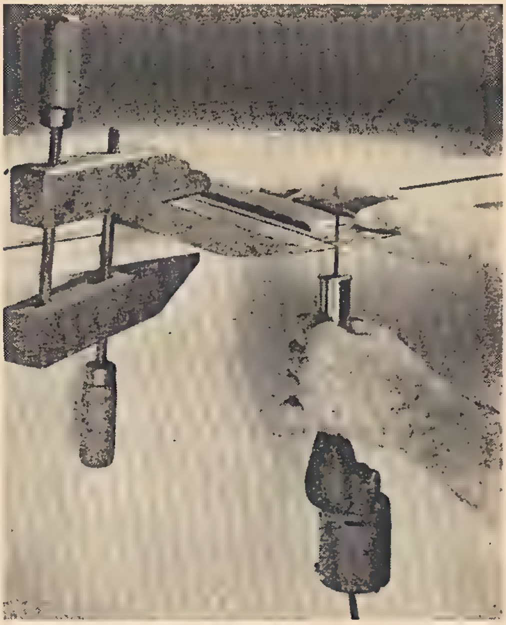
NEW ELECTRIC HAMMERING TOOL



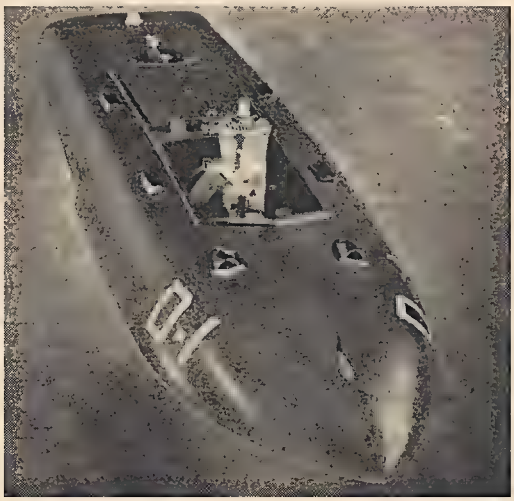
A new craft tool on the market works on either metal or leather. Delivering 800 blows per minute, the stroke length can be varied from 3/8" to 1 1/8". Sawing and filing attachments are available for the tool giving it a wide range of use on materials.

This tool is simply plugged into any convenient lighting socket and then applied to the work at hand. The high speed hammer greatly reduces the time formerly required to turn out the type of work shown. As the strokes may be adjusted to suit the type of material being worked, excellent results can be obtained.

It is handled in similar fashion to an electric drill, and is of about the same weight. When the sawing or filing attachments are employed, the device permits an extremely wide range of operations. Model makers can turn out metal parts of shapes hitherto impossible without machinery costing many times the price. Filing such shapes by hand would be a long and tedious procedure.



Model makers will admire the sleek lines of the new bakelite model racing boat shown below. The entire top part of the hull is molded of that material. The bottom is planked with waterproof resin bonded plywood. The construction kit includes fittings, propeller, and rudder in addition to the hull parts. The boat is designed for the "D" class in competitive model boat racing.



Top Sport for Thrills —Motorcycling

SOMETHING doing every minute when you ride a Harley-Davidson. You get more fun out of life — visit famous beauty spots — explore distant places — go on glorious vacation trips at little cost. Take in exciting club rallies, hill-climbs, race meets and other thrill-packed motorcycle events. Visit your Harley-Davidson dealer today — see the 1941 models with their airplane styling, zooming power, rugged dependability and important mechanical improvements — and ask about his Easy Pay Plans.

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WORLD'S CHAMPION MOTORCYCLE

200-Mile National Speedway Championship again won by Harley-Davidson. Louis Guanella first — setting new A.M.A. record. First seven places go Harley-Davidson!

HARLEY-DAVIDSON MOTOR CO.,
Dept. MI, Milwaukee, Wis.

Send pictures and descriptions of smart 1941 models. Also FREE copy of big 24-page ENTHUSIAST magazine filled with thrilling motorcycle photos and stories. Stamp enclosed for mailing cost.

Name ....

Address ....

....

Sound Of Things To Come!

[*Continued from page* 63]

bombs—in fact any of the large noises. Since there is no distortion in FM, we'll be able to do a lot of new things.

"You know that nowadays all the 'small sounds' are lost in amplitude modulation broadcasting. Such noises as, say, removing your coat or vest. We'll be able to give you that when FM rolls around. And a great many of our synthetic effects will have to be abandoned, too.

"Today we have a lot of trouble with water sounds. They get 'washed out' in the transmission from studio to receiver at home. In other words, all the wetness is taken out. FM doesn't have that trouble."

Over at CBS the sound effects department sees a number of hopeful advantages in FM, too. Walter Pierson, who heads the group, declares: "I have a feeling that it will bring about several important changes. The tinkle of glass, for example, will be improved. When we're called upon to handle fine goblets and glassware, we'll get excellent results. In fact anything with fine overtones will come through beautifully on FM.

"In ordinary radio you don't hear such high frequencies. Water effects in particular will be much better. But we'll have to be very careful in the FM studio, since the slightest noise is picked up clearly. A sound effects engineer, for example, standing off in the corner, tinkling coins or keys in his pocket, might easily enough upset a program. Who knows but maybe you'll see the day when all persons taking part in a broadcast, including the studio audience, will be required to empty their pockets before going into the studio!"

Pierson also points out that the high tensile sound of surgical instruments, sometimes necessary in dramatic sketches, is very troublesome under the present system of broadcasting. Quiz shows using silver dollars as prizes will be infinitely improved—since today silver dollars on the air sound like iron washers. Other new vistas in noisedom that send sound effects men into happy raptures include cowbells, cups and saucers, chains, keys, crackling fire, watches, clocks and rain.

Demonstration programs, designed to show the superiority of FM over the ordinary method of broadcasting, are now being held in many parts of the country. The clarity of reproduced sounds invariably brings oohs and ahs from listeners—particularly such noises as the pounding of nails (with the tone of the blows changing as the nail sinks into the wood), wood-sawing (with the teeth of the saw biting realistically, followed by a thump as the sawed-off end falls on the floor), mixing of a highball (the clink of ice and sharp fizz of carbonated water).

The announcing profession will also see changes due to the advent of FM. Affected, bombastic voices will come over the air poorly, and the premium will be on natural, genuine personalities that use precise inflection and pronunciation. As Charles Godwin, chief announcer at Mutual, puts it: "There can't be any stuffed-shirt announcers in FM—literally or figuratively. Announcers must be careful of formal evening clothes when they face the super-sensitive FM mike because the crinkle of soup-and-fish fronts will be picked up. And announcers can't be stuffed-shirt in manner either. FM wants natural, informal announcers. Pompous and affected mikemen are definitely taboo.

"Announcers are going to have to learn new methods and new tricks for FM," Godwin continues. "You see, in regular broadcasting they've been accustomed to stand about a foot or two from the microphone, but with FM they'll have to get at least six feet away. Announcers must learn to modify their delivery to this new situation, and some may even have to change their style. Those ultra-intimate announcers who like to 'crawl into' the mike may have difficulty. Above all, FM is so sensitive, announcers must be more careful than ever of their diction and enunciation."

Pat Kelly, Australian-born chief announcer at NBC, who is no relation to the NBC sound effects head of similar name, also favors FM when he says: "It will give the richer, purer voice a chance to show off to much better effect. By the richer voice, I mean the baritone."

FM promises new tricks for the dramatic actors and actresses who stage our radio plays. Unless they change their technique, working much further away from the microphone, the FM loudspeaker will be filled with an odd assortment of mouth noises, sibilence, and harsh voices. The rustle of paper as actors turn from one page of the script to the next is also apparent. Perhaps radio thespians of the future will be forced to memorize their lines. In any event, the keener ear of the FM mike will unquestionably put an increased emphasis on dramatic ability, raising the caliber of daytime script shows.

FM's greater pictorial ability may also be well used to good advantage by manufacturers of ginger ale, effervescent alkalizers, engine-soothing motor oils, noiseless typewriters and other products whose merits can be represented in sound or sound comparisons. Whatever the progress of FM, it inevitably seems to lead to a higher degree of realism and finer sound illusions than the American radio public has ever known before!

About one-fifth of the Atlantic coast oysters come from Virginia waters.

A self-heating aviator's suit of rubber is being turned out for the Army Air Corps.

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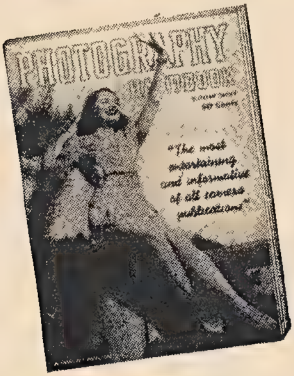
GOOD PHOTOGRAPHY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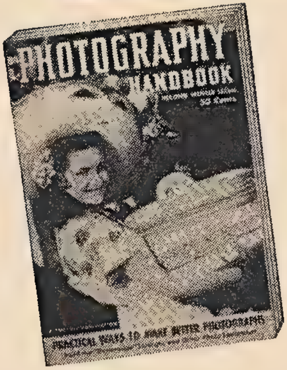
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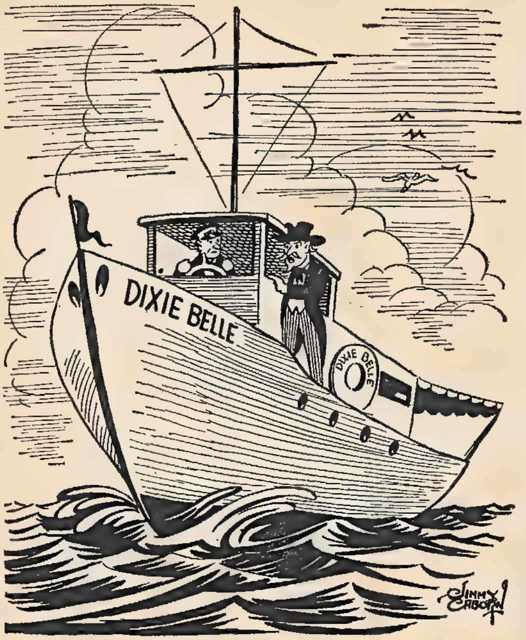
Wings Over The Water!

[*Continued from page* 47]

airport for the cooling breezes of a lake or a river; they bless the day they were forced off busy airports by the airlines, and moved to a water base where the crowds are—the stable population from whom they get students and charter hops, and the transients that are a steady source of new business and free advertising. Every flight a ship makes is an advertisement for the business.

We are blessed in most sections of this country with an abundance of water areas. Here is a God-given airport which often stretches for miles. Perhaps the CAA has already provided the landing float. For a few hundred dollars a ramp can be built and the ingenious operator can construct a small marine railway and a Boston dolly for hauling his ships from the water.



"Throw that confounded Yankee compass ovahbo'd! It keeps pointin' No'th!"

In many areas the state pays for the material and the NYA boys do the work. The state maintains and operates them, in some instances letting out concessions to private operators. The East coast has dozens of these operators, with its miles of rivers, bays, and inlets attracting more pilots every year.

One of the oldest is the Winnepesaukee Air Service of New Hampshire founded by Bob Fogg, who is now the Seaplane Facilities Expert for the CAA and who is the man to ask for help and advice concerning seaplane bases. He has been flying seaplanes for over twenty years and is a real enthusiast. In addition to the technical details, he is a master showman at knowing how to draw in the crowds for seaplane openings and ceremonies. The seaplane service which he has founded has flown some 60,000 passengers without an accident of any kind. A seaplane that stalls or spins in, usually lands in such a way that a wing-tip and a float hit the water first. This provides a cushioning effect. Planes have been completely demolished on falling into the water but pilots are seldom seriously hurt.

Guy A. Ham has maintained a charter service, the Cape Aircraft, Inc., on Coonamessett Pond, West Falmouth, Massachusetts, for five years, and although Guy is now an instructor at the Harvard Aviation Camp on Cape Cod, the Cape Aircraft still services all seaplanes landing on Coonamessett Pond.

Jack McManus operates from Lake Winnepesaukee and although only 3,000 feet from Bob Fogg's, neither one complains of competition. The ingenuity of this operator can well be proven by the fact that he built his own ramp at a cost of $72 and uses his car to haul the plane out of water. To take off, he releases a mooring cable, starts the motor and wiggles the tail surfaces to start the plane sliding down the ramp and into the water.

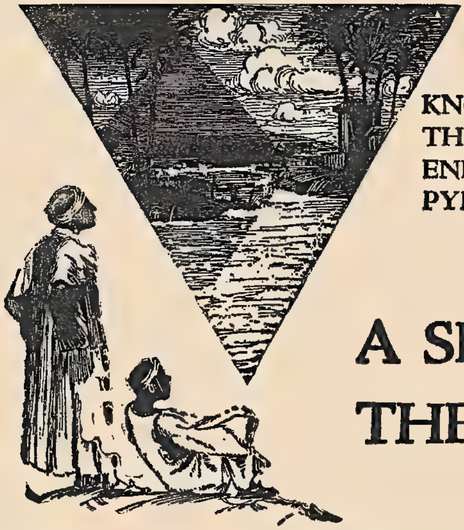
Another seaplane pilot, way down in the heart of the Blue Ridge mountains, used to fly ten miles from the airport to town—Charleston, West Virginia—but decided to move where the people were. He bought an old barge, and built a hangar on one end at the cost of $700. Since then he has expanded several times. Being on the waterfront, he gets lots of visitors, so he built a restaurant for them, also put in an out-board motor boat business and other attractions that pay him well.

A Boston operator, E. W. Wiggins started his business at the Boston Municipal Airport, putting some of his ships on floats and taking them to Naples, Maine, for the summer. Today, in addition to his original bases, he operates at Norwood, Massachusetts, Newport and Providence, Rhode Island, featuring airline charter service, aerial advertising and CAA approved flying and ground schools.

As late as 1936, seaplaning was definitely a rich man's sport but now with air flivvers such as the Cub and the Aeronca, pontoons can be had at a comparatively low cost, complete with struts for attaching them to the fuselage. Pontoons with retractable landing wheels are to be had today, and the plane thus equipped can be handled both on land and water.

The story of the Wall Street ramp, in New York City, is fairly well known. Every year sees more

[*Continued on page* 138]



KNOWLEDGE THAT HAS ENDURED WITH THE PYRAMIDS

A SECRET METHOD FOR THE MASTERY OF LIFE

WHENCE came the knowledge that built the Pyramids and the mighty Temples of the Pharaohs? Civilization began in the Nile Valley centuries ago. Where did its first builders acquire their astounding wisdom that started man on his upward climb? Beginning with naught they overcame nature's forces and gave the world its first sciences and arts. Did their knowledge come from a race now submerged beneath the sea, or were they touched with Infinite inspiration? From what concealed source came the wisdom that produced such characters as Amenhotep IV, Leonardo da Vinci, Isaac Newton, and a host of others?

Today it is known that they discovered and learned to interpret certain *Secret Methods* for the development of their inner power of mind. They learned to command the inner forces within their own beings, and to master life. This secret art of living has been preserved and handed down throughout the ages. Today it is extended to those who dare to use its profound principles to meet and solve the problems of life in these complex times.

AMENHOTEP IV
Founder of Egypt's
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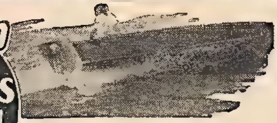

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Oil From The Earth's Core!

[*Continued from page* 81]

penetrating power, drillers are already contemplating going down more than four miles in their search for gold!

Their hopes are justified by past performances. The huge rig mentioned is engineered to drill 17,500 feet. Others, planned to go down only 10,000, have been landed well below 13,000. So, say petroleum engineers, there's no reason why the big fellow can't hit four miles, or more.

Off the Gulf coast of Louisiana several rigs, standing on submerged barges are pressing down through the salt water sands into submarine deposits lying nearly three miles below the ocean bed. In Dewey County, Oklahoma, a bit recently rested on the bottom at 14,582 feet. Recent surveys on Washington's Olympic peninsula, called the "last wilderness" of American oil exploration, indicate oil-bearing marine beds to be nearly six miles thick.

When drillers reach the bottom of those beds, whose limestone bases probably mark the depth end of the world's oil supply, they'll go down with incredible speed, and perhaps at a much lower cost than is now anticipated. Three years ago, oil companies spent $300,000 and more to drill a 15,000-footer, taking nearly a year to do the job. Now they can perform this miracle in less than two months at half the cost!

Heretofore, only the cost of drilling and existing prices for petroleum products stood in the way of reaching sensational depths. Now, with defense giving a vital reason for finding new oil beds, the drills are really beginning to go down deep.

"We'll find new fields," claimed one enthusiastic driller, "if we have to bore through to China!"

Wings Over The Water

[*Continued from page* 136]

business men commuting by seaplane. This successful development is typical of what every large city with a waterfront will have in the future, especially with the advent of the flying boat, a two place plane that lands on its hull much like the huge China Clippers. Its 75-horsepower engine makes it adaptable for use in the mountainous country and the lowlands as well.

As a result of the CAA program, the production of seaplanes has increased 50% within a year's time and water flying has gained an appeal which attracts people who would not otherwise fly. As a means of recreation and commuting, the seaplane is without peer, and most of today's seaplane owners have purchased their first plane for that particular purpose. With a seaplane a pilot can fly to a lake in wooded country only an hour or two away by air, with no possible landing place for wheeled planes. Landing, he can taxi to a likely spot, anchor, and break out his fishing gear. If the fish aren't inclined, he can move to another spot within short flying distance.

Blackout Photography

[*Continued from page* 37]

rollfilm sizes. Eastman markets infra red film in 35mm, Bantam and popular rollfilm sizes in addition to the cut sheet film and plate forms, each in a variety of sizes. Take your pick; the cost is nominal and emulsion speeds about equal.

General Electric No. 21 or Wabash No. 2 bulbs are recommended for blackout flash photography. Using the G.E. No. 21 lamp, it was found that the minimum synchroflash exposure at 6 ft. was 1/200 at f/3.5, using a No. 87 gelatin filter in the flash-filter unit described above. Multiplying the "f/" number by the distance, this amounts to a flash factor of 21; a negative of equivalent quality can be produced by using any distance (in feet) and "f/" number whose product equals 21—as long as the same shutter speed, flash bulb and reflector are used. Synchronizing at 1/50 second permits the flash factor to be doubled, to 42.

The exposures and flash factors above are of course approximate. They will vary somewhat with the infra red transmission of the particular camera lens used as well as with the efficiency of the camera shutter and flash reflector. Exposure should be standardized before serious work is done.

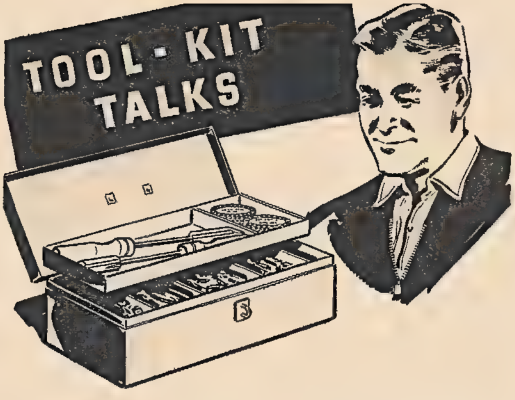
Although these exposures would seem to limit blackout flash photography to fairly close subjects, inanimate scenes may be photographed by this system from quite a distance. To do this, set up the camera on a tripod leaving the shutter open at time and then walk closer to the subject than the camera position, shooting more than one bulb at a time with the flashfilter unit, and from different positions.

The usual infra red focusing corrections must be made for blackout flash photography. Generally the lens will have to be racked out about 2% beyond the position at which the visual focus is sharp. This makes the infra red rays converge on the film plane. The use of a Wratten No. 25 (red) filter will help correct visual focusing on the ground glass screen.

The developing procedure for infra red film is quite ordinary. Just be sure to develop in total darkness as with ultra rapid panchromatic films. For serious work, infra red film may be hypersensitized before or after exposure in mercury vapor, which will just about double its emulsion speed.

In making infra red photographs of people it will be noticed that there is a considerable whitening of skin tones. This can be overcome to some extent by application of a dark brown "sun tan" powder to the face, and the lips will photograph more naturally by the sparing use of brown or black eyebrow pencil instead of lipstick.

It has been estimated that the German army used more gasoline in its four-week campaign in the low countries and France than in the entire World War.



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Air vs. Liquid-Cooling

[*Continued from page* 45]

flight across the Atlantic Ocean. They had taken off from Newfoundland and landed near Clifden, Ireland—nose down in what had deceptively appeared to be a "smooth green field." Two water-cooled Rolls Royce engines provided the power for their specially adapted Vickers bomber.

Despite the success of their flight, Alcock and Brown and their feline mascots were soon forgotten. When Lindbergh made his flight in 1927, however, his air-cooled Wright Whirlwind engine exerted great influence on the industry. Its faultless performance on such an epochal over-water flight no doubt had its effect on the U. S. Navy—today's record breaking Vought-Sikorsky naval fighter, XF4U-1, is powered by an air-cooled motor. This ship, with its Pratt and Whitney 18 cylinder two-row radial, of 1,850 horsepower, is reported to be faster than the Army's liquid-cooled Lockheed P-38 and Bell Airacobra. Army liquid-cooling suffered another major setback when the Navy's air-cooled Grumman Skyrocket whined across the skies at better than 400 m.p.h. a short time before.

The majority of inexpensive civilian light planes have now also taken to air-cooling for their power plants. The ease of manufacture, servicing, and repair, makes the air-cooled motor logical for private use. The elimination of anti-freeze solutions in another convenience apparent even to the earth bound motorist.

At the other extreme the largest and most powerful airplane ever built, the 212-foot Douglas B-19 bomber, is powered with four air-cooled motors. The Boeing "flying fortresses," likewise, rely on air-cooled engines.

The vulnerability of a liquid-cooled engine is slightly higher than that of an air-cooled one. The radiator must be of thin material in order to dissipate the engine's heat properly. As the water-cooled engine has all the other parts found on an air-cooled engine, it is apparent that the radiator is one added Achilles heel. While an air-cooling fin, chipped by some missile or fragment, does not necessarily put the engine out of commission, a punctured radiator eventually does. When the cooling fluid leaks away, a fluid-cooled engine quickly overheats and "freezes," or sticks.

The smaller radiators now in use, however, are difficult targets. The visibility advantages of fluid-cooling, are therefore able to balance the argument. A careful survey of European war planes proves absolutely nothing. A glance at the Army-Navy cooling feud in the United States shows records alternately being broken by each type of engine. Perhaps the answer lies in the perfection of the gasoline engine, itself. The problem may be solved in the not-too-distant future by an engine that requires no cooling whatever.

A new petroleum lubricant "desqueaks" rubber.

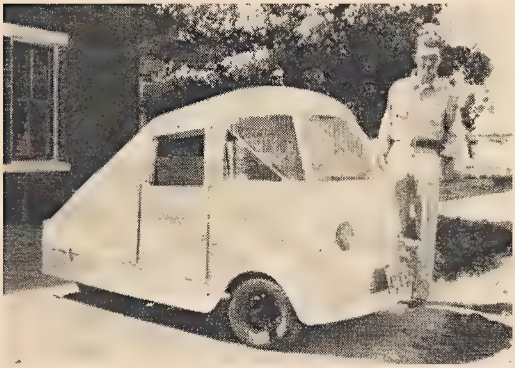
Editor's Workbench Chips

[*Continued from page* 21]

Professor Harvey says, however, that when you place potatoes in a darkened room and flash ultraviolet on them, you can tell in a minute the ones that are good from those that aren't; the good spuds remain invisible and the saboteurs glow with a "ghostly, greenish" light. The moral, then, is to get yourself an ultraviolet lamp, if you plan to grow the mysterious Murphys. After all, you wouldn't want a Karloff in your potato bin, would you?

* * *

ON PAGE 40 of this issue you'll find what we think is a mighty important article, a discussion of the relative merits of air cooled engines for aircraft as opposed to the water cooled variety. As you know, this is an argument that has been going on ever since the Wright brothers took off from Kitty Hawk, and we don't think for a moment that our little story will settle the matter one bit. The discussion still goes on, though we have it on direct word that the argument will be settled when they invent an engine that won't need to be cooled at all. At any rate, we think you'll be interested in the article, especially if you've been reading about that 2,000-h.p. engine Uncle Sam now has for his fighter planes. The most powerful engine now in use abroad, you know, is a 1,250-h.p. job, and if we get into active production on a large scale of the 2,000-h.p. plants, you can see where the rest of the world's planes, including our own, soon would be obsolete. Well, we don't want to take any sides in the air cooled versus water cooled battle, but we may as well tell you that this new 2,000-h.p. creation is air cooled. You don't have to draw any conclusions either, if you don't want to. We're just giving you the information—take it or leave it.—*The Editor*



This car attracts a lot of attention wherever Gaylard Train, of Hardy, Neb., drives it. It is a three-wheeled job of his own design and construction. It uses a Model T frame which was shortened and narrowed at the rear end. It is powered by a Harley 74 and has a Harley three-speed transmission. Top speed is about 45 m.p.h. A $3.00 Workbench check is going out to Gaylard for this snapshot.

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3-IN-ONE OIL

Snapshots Of Court Shots!

[*Continued from page* 82]

By means of the newly developed multi-flash camera, one can see the perfect arcs and whirls, step by step, as the ball approaches the basket. With this new type of photography, the fans can now fully appreciate the artistry of shot making. Likewise, coaches with adequate photographs at their command, can better instruct their players.

Unquestionably this high speed photography will take it's place in helping coaches just as the slow motion movie is being used by football coaches to assist in instructing the team. The multi-flash camera is superior because it stops the ball from 10 to 600 times per second enabling the coach and players to follow the exact arc.

Since the complete action is frozen on a single photographic print showing what happens to a basketball, and other equipment used under actual playing conditions, this new method of photography is also very useful in the study of athletic products.

In taking these interesting pictures, George Temple used a regular Eastman Kodak 5x7 view camera with a 4.5 lens, for both multiple-exposure and single flash shots.

Multiple exposure photography is made possible by the aid of a Stroboscopic light which controls the number of exposures in a print. The light can be set to flash at varying speeds, ranging from 10 to 600 flashes per second. Spalding is justly proud of its multiple exposure technique since it is the only one in the world at present equipped to take action multiple exposure pictures.

Single flash pictures are taken with the same camera at 1/30,000 per second. Again a special light is used, one that can be synchronized with the camera and can even be controlled with a sound pickup when desired.

Musical Number, Please!

[*Continued from page* 78]

the invention came when they discovered they could have their requests played not only in their own bar but in any of the other bars subscribing to the service. Not only that, they could dedicate the performance to anybody who was, at that moment, in any of the other cafes. For example, a celebrant in a night spot, who knew that his fellow worker was in some dining place, could put in his nickel and request that a number be played in that location for his friend's benefit. Presently a mellow feminine voice would dedicate it.

Two floating Weather Bureau stations have been established on U. S. Coast Guard cutters in mid-Atlantic since war has almost cut off weather information from ships at sea.

A camel can take 15 gallons of water in one drink.

How To Buy A Used Car

[*Continued from page* 88]

excellent indication of the car's qualities, though its efficiency has been somewhat dimmed by corrective devices of underhanded dealers. A favorite is putting sawdust in the rear axle to hide telltale hums.

Check to see if the car uses oil excessively. Start the motor, put the gears into neutral, and pull the throttle out. If the exhaust exudes *bluish* smoke, the car definitely is an "oil-burner."

Brakes that go all the way to the floorboards may need adjustment or relining. Even though they seem to be in good order, they may be drawn up to the last notch. Where the brake lining is gone, brakes are often tightened until the brake shoe and metal drum make a metal-to-metal contact which works well temporarily. It is also a simple matter to create a new brake "feel." All the dealer needs is a piece of inner tube slipped between the brake-shoe and the drum.

If the brakes are of the hydraulic type, snap your foot down hard and continue to exert pressure. A sinking underfoot means that the fluid is leaking out past the brake pistons. The repairs are expensive.

Watch out for slipping clutches. A properly adjusted clutch takes hold gradually and releases the instant the clutch pedal is depressed. To test it, keep the motor running, put the emergency brake on hard, shift into low and let the clutch engage the motor. If the motor doesn't stall immediately, but continues to turn over, the clutch is slipping. This wastes power and fuel, besides putting an extra strain on the motor.

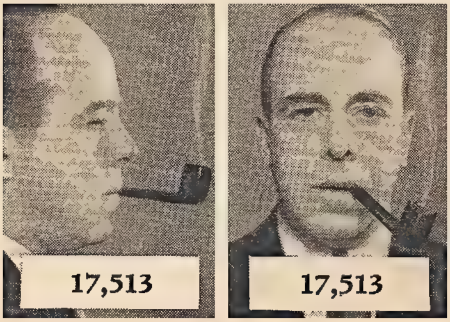
The steering wheel should be tried for excessive free movement. If there are more than two inches of "play," the worm apparatus which controls the steering mechanism is badly worn.

The front wheels should have proper "caster." This is an adjustment action which causes the wheels to return to a straight ahead position after the car has rounded a corner. In the same category is "drift," which is a tendency of the car to edge toward one side of the road although the front wheels are in the straight ahead position. Improper alignment, bent springs, or broken shock absorbers are the probable causes.

Be sure to get a written guaranty covering both labor and parts for at least thirty days. Guaranties that call for replacement of defective parts alone with the customer paying for labor mean that in reality he pays for the parts, too. A guaranty that puts the burden of proof on the purchaser is valueless. If the dealer has stated that the car has been reconditioned, have him include this in the instrument.

The purchase of a used car is a serious business. If possible, bring a skilled mechanic along. Lacking this, keep these few fundamental rules in mind and remember, it is better to do your detective work before and not after you buy the car.

HELP
LOCATE THIS MAN!



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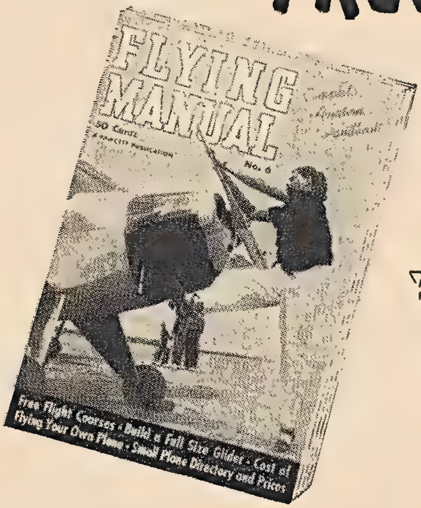
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Print "Dodging," One Lesson

[*Continued from page* 91]

portions of the picture, it was found that the delicate leaves called for only 20 seconds printing time and the upper petal portion, 40 seconds. The total printing time required to darken the background areas ranged from one minute and 20 seconds to two minutes and 5 seconds. The printing was done in the following way:

First, the entire negative was given 20 seconds. The central and upper portions of the blossom were then given an additional local printing of 20 seconds—Figure 1. Following this, the background to the right of the blossom was given an additional 45 seconds, the background to the left one minute additional, and the background at the top of the print one and one-half minutes more than the blossom. The technique illustrated in Figure 2 was employed to burn in the background in each case.

In subduing the spotty foreground and background of the calf picture, a small, round dodging disc was used to hold back the principal subject—Figure 3. The head and shoulders of the calf were printed for 20 seconds in a general exposure of the printing paper. Then the background was given 45 seconds additional exposure and the immediate foreground, 65 extra seconds of burning in. Slight but constant movement of the dodging disc made for the soft blending effect obtained.

"Darkroom Spot" Inspection

[*Continued from page* 93]

exact center of the disc with a narrow chisel and hammer. Solder the disc onto the bottom of the socket. Then connect a length of "pull-apart," rubber-covered drop-cord to the socket and pass the cord through the ⅛-in. pipe. To prevent rust, paint the reflecting side of the disc with aluminum paint, and the back of the disc with black enamel.

Slip the flange and wood-disc unit onto the pipe. Insert the socket unit into the tube and fasten the wood disc to the end of the tube with three, round-head wood screws ¾ in. long.

If you do not want to fasten a pull-chain switch to the ceiling of the darkroom, simply tape a small bakelite pull-switch to the cord that suspends the inspection lamp. One side of the suspending-cord is broken and the pigtails on the switch are soldered to the cord and taped over. A pull-cord is tied to the pull-chain and led down the side of the lamp through a screw-eye—the latter replacing one of the screws that holds the wood disc into the end of the tube. If the walls of the darkroom are white, it is recommended that a hard rubber or other black hypo tray be used, as a black tray will reflect very little light when it is filled with hypo solution.

Graceful Console Table

[*Continued from page* 99]

itself. The legs are held in place easily with 3-inch lag screws and bolts which you may purchase second hand from any upholsterer. Before installing them it will be better to practice on an old scrap so your chances of splitting the legs will be lessened. Then tack the plywood bottom into the rabbets of the side members.

The stretcher is next doweled and glued to the bottom of the legs. The tracks which receive the beveled battens of the table top are screwed in place. These consist of four strips cut to a 45 degree angle on one side and installed as shown. On the back top panel member, that is the one which faces the wall when the top is up, you will have to carefully locate the beveled battens that slide into the tracks. Candle wax rubbed over the moving parts to prevent binding is next applied.

The top itself is glued up from three boards each 10" wide and about 30" long. Two hinges, mortised so that they are hidden when the top is lowered, hold the two pieces together.

The four pieces of beveled battens which enter the ways of the table, are bradded lightly into place until you determine their exact position. Then screw down firmly using flat head screws 1¼" long. The arm which holds the top vertical is fastened into place next. A slot at the lower end fits snugly beneath the head of a round-headed brass screw.

The Vultee Vanguard

[*Continued from page* 112]

to shape and cement it to the bamboo. Cut a notch in the bamboo for the wire so it will fit flush to the 1/32" sheet balsa landing gear cover, which is added after the wire is cemented to the rib No. 3.

Cover the fuselage first, using dope to stick the paper, all but the part where the wing is filleted into it. It should be covered in small pieces to avoid wrinkles. Next cover the wing and fillet it into the body very carefully. This will not be found difficult if small strips of paper about ¼" wide are used, running the length of the opening, each one overlapping slightly. Trim the surplus paper with a sharp razor. Cover the tail surfaces on both sides and cement to fuselage. Make sure they are in correct alignment. Then spray the whole model with water. When the water is dry give the model one coat of thin dope. Make the cockpit enclosure of thin celluloid. Cement it on in sections over the framework. Dope thin strips of black tissue to the covering of the wing and tail panels to represent the control surface junctures.

Use four stands of ⅛" flat rubber to power the model. A wire pin holds the rubber in the rear of the fuselage.

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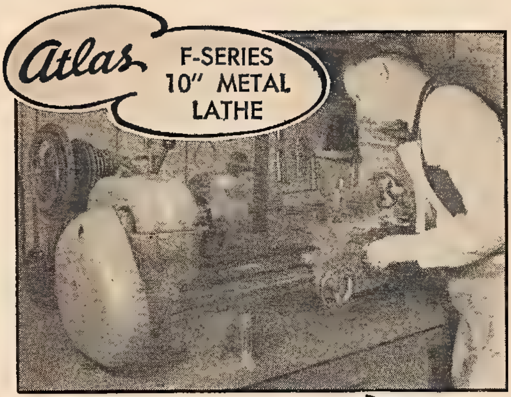

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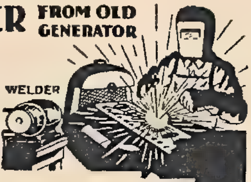

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Gadget Man!

[*Continued from page* 77]

costs in planning new devices, and Whyman usually re-designs their products. Nearly all must be constructed of light-weight metal to permit mass production stamping. Too, they must be compact. One man brought him a four-tier tie-rack. After studying the device, Whyman started to turn out 100,000 of them, each measuring 4x9 inches, with four bars capable of taking 32 ties. More important, each tie may be picked off individually and not pulled out. The four bars are so arranged that they may be swung in and out by pressure on either the lowest or topmost.

Turning out 100,000 toy rifles in twenty working days was no trick at all, to hear Whyman explain it. First, he bought the stocks ready for assembly. Second, a workman stamped out the blanks for the star wheel and trigger from bar steel. As these rolled off, another man swedged the shaft into the star wheel so it would turn with the shaft. Next, the trigger was connected to the shaft. Then the metal barrel and other parts were dipped into black enamel, baked and delivered to the assembly table. After these parts were brought together, the stock was riveted to the frame, two rivets being used. As the final step, the completed rifles and a half-dozen rubber bands were packaged. The parts never piled up, and each day's output was boxed ready for delivery that night.

Whyman looks on his novel enterprise only as an elaboration of a home workshop. He parcels out the various jobs to his employees, and he does the perfecting of the gadgets, and later, the marketing of them.

A manufacturer came to him not long ago, requesting that he make a sure-hold towel rack. "In most homes," explained the gentleman, "towels too often slip to the floor." Whyman agreed with this observation, and a few weeks later was manufacturing small pressed frames containing three rubber discs, each containing three slits coming together at the center. Now milady need only press a corner of the towel into the disc and it will hang there forever. Yet only a slight pull will remove the towel.

Many of these devices are practical, while some combine novelty with practicability, being more novel than practical. Such is the essence of a lighted boudoir lamp. Containing six ounces of cologne, the bottle is fitted with a cap containing a small battery and a lamp. By twisting the shade, you turn on the lamp. Shade, battery and tube are easily removed when access to the cologne is desired.

His newest is a question-and-answer bank. The gadgeteer only the other day started work on this one. You walk up to the device, ask a question, and Madame Melba nods or shakes her head. Her responses depend upon how the coin strikes a mechanism inside. When he figures out how to press it from two pieces of metal, it will appear in dime stores from coast to coast.

Knight In Armor Fire Screen

[*Continued from page* 104]

¾" x ⅜" is used for the frame and this may be purchased at almost any hardware or builders' supply house. Just 37 feet of this are required. The screening is of ⅛" or ¼" mesh hardware cloth. Obtain this in the 28" width 1¼ yards long. From the drawing lay out the entire screen and wings on a level floor and mark the location of the lap at the top of the main frame. The bends in these channels are made cold although they may be made hot if facilities are available. Hammer the channels to accomplish the bends. Bend all of the pieces, fitting them to the floor layout. Note that all of the pieces are double as shown. Now drill the pieces with 7/32" holes as shown, by clamping matching pieces together. When drilled, bolt the frame together as a final check and then cut the hardware cloth to fit just inside the channels.

From ⅛" pipe saw off 54 spacer pieces to fit between the channels. Now reassemble the frames with the hardware cloth between by bolting through the pipe spacers. Note that these spacers stretch the hardware cloth as the bolts are drawn up. Next replace the bolts one at a time with 3/16" round head rivets. After the riveting is completed cut a single length of channel for the center vertical piece. Be sure this is long enough to stretch the screen. This piece is located at the back and is held in place by three rivets into the screen using a washer next to the screen. After this, drill the butt hinges located at the back, and rivet these in place as shown. Then cut out the pieces from No. 26 ga. copper for the ornamental helmet. Using a ball peen hammer, hammer these pieces from the back to form a bas-relief. If the copper becomes hard to hammer or form, heat over a gas flame until red and quench in water. This anneals the copper and it may again be formed easily. After hammering the visor piece of the helmet cut the edges of it to fit neatly over the curve of the head piece. A copper rivet is inserted at the visor hinge to hold it to the head piece. Solder holds the outer edge to the head piece. Also solder the plume to the back

[*Continued on page* 148]

Here's how to solder the bolts to the back of helmet.

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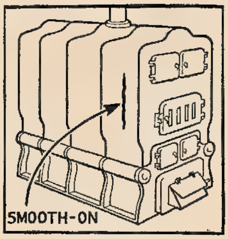
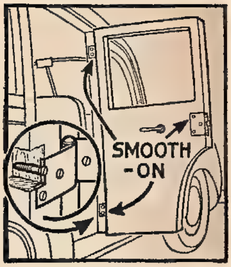


Sealing Crack in Boiler



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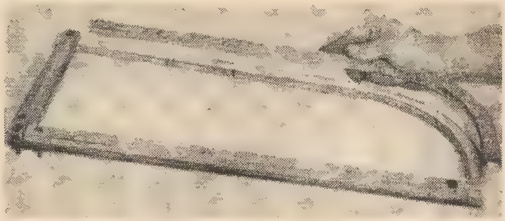
Knight In Armor Fire Screen

[*Continued from page* 147]

of the head piece. Then solder six 1/8" x 3/4" bolts to the back of this assembly. Polish the helmet and bolt it to the center of the screen using washers next to the screen at the back. This also helps to tighten the screen and the excess bolt length is then cut off.

Clean up rough places on the frame with a file and steel wool and paint with statuary bronze. Two coats will be necessary.—*R. T. H.*



This is the way the curved channels are matched up.

(Correct Answers To Quiz On Page 73)

1. True.
2. False. A socket wrench is a tool.
3. False. A toxophilite is a person interested in archery.
4. True.
5. True.
6. False.
7. False. Pythagoras was a philosopher.
8. False. A pterodactyl is an extinct flying reptile.
9. True.
10. True.
11. True.
12. True.
13. False.
14. False. It is a type of whistle.
15. True.
16. True. The prize was offered by Edwin Gould.
17. False.
18. True. The Vought-Sikorsky VS-300.
19. True.
20. False. A rocker arm is a part of a gasoline engine.
21. False.
22. False. A radial engine has a revolving crankshaft. A rotary engine has a stationary crankshaft, the engine revolving.
23. True.
24. True. The surface of a propeller blade that corresponds to the upper surface of an airfoil is called the "back."
25. True.

Checks have been sent to the following: Ross R. Latchaw, Ida Grove, Iowa; Lew Gourley, Jr., Shoshoni, Wyoming; H. Radzinsky, Great Neck, N. Y.; Theron G. Cady, Palo Alto, Cal.; Angil Tomontong, Waipahu, Oahu, T. H.; Casimer Remus, Pittston, Penna.; Edwin H. Chase, Lyndhurst, N. J.; Ted Wilson, Marshall, Minn.

"All-Wave Eleven"

[*Continued from page* 103]

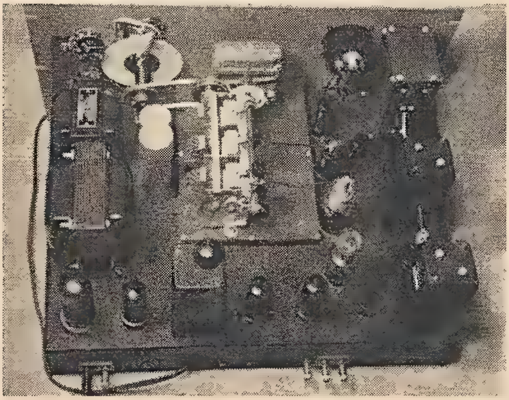
The coil set is the biggest part and it is well to get the holes for this, together with those for the tuning condenser and dials, cut out first. As it comes, the coil set is too high and must be disassembled so that the three shield pieces may be trimmed down a bit. Remove the two long rods that hold all sections together and trim off the three shield pieces on the upper side (opposite side from that in which the trimmer screws face) until all are 3¼ inches high. Then reassemble, using care to get the various washers and spacers back in the proper places.

The coil set is still so high that a hole must be cut in the chassis for it to pass through and a shelf built above it. The hole is 8¼x5¼ inches and is made with a hacksaw blade, starting each cut in a series of four or five ⅛-inch drill holes. When the edges are smoothed the shelf may be assembled. It must be ½ inch high, so ½x¼-inch dural strips are used for sides and back. Three pieces are required, as none is used in front (although a front piece would give a little more rigidity). The shelf top is a plate of aluminum 8¾x6 inches x ⅛-inch thick and three screws through each side and through holes in the dural strip hold the whole thing firmly to the chassis.

The next job is to mount the band spread dial and its housing. This is centered laterally on the shelf and the housing is ⅜ inch back from the front of the chassis. It is held by four machine screws.

The tuning condenser gang may now be set in place with the front edge of the frame 3⅜ inches back from the front chassis line. Three screws hold this unit, two in front and one at the rear, and it will doubtless be found that several thin washers are required beneath the condenser brackets in order to raise the band spread shaft (the small one) on a line with the dial shaft. The flexible coupling will take up a certain amount of

[*Continued on page* 150]



Arrangement of chassis is compact, balanced, yet not crowded. Note antenna and ground terminals, and speaker receptacle at rear of set.

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"All-Wave Eleven"

[*Continued from page* 149]

misalignment, but every effort should be made to get the two shafts as closely in line as possible. The band spread dial and condenser should turn very smoothly when properly adjusted. Remove the stop pin on the rear of the condenser shaft before final assembly.

The band-set dial should be mounted next. Note on the top view of the chassis that rectangular cuts are made in the chassis top both sides of center. The dial is mounted in the right hand cut with the bottom of the shaft just level with the chassis top. Two flat-head screws through the front drop hold the dial firmly.

An upright post of dural ½x¼x2½ inches is now cut and mounted 2¼ inches back from the chassis edge. Mark the spot on this piece which is directly behind the shaft hole of the dial and drill a ¼-inch hole. A short length of ¼-inch rod then is fitted from the dial through the post, to extend about ½ inch behind the latter.

The band-set section of the condenser may be driven by dial cord, wire belt, or flat strip. The latter is used in this set; the 1¾-inch diameter drums over which it runs were obtained from an old broadcast set together with a length of ¼-inch wide thin brass strip to connect the two. The strip is cut about 1½ inches shorter than is required to run all the way around both drums and a coil spring fastened between the two ends, with sufficient tension to take up all backlash in the drive.

The chassis may now be drilled for all other parts. The layout does not show the actual holes used for mounting screws, but the center point of each part is marked out so that no confusion will exist. Sockets are held by 6/32 screws run into holes tapped in the chassis. Hole sizes are noted on the drawings.

The panel is drilled last. The meter and the bakelite plate for the band-set dial are mounted in two 3/16-inch diameter holes made with a fly cutter.

Note that the bottom of the panel is not flush with the lower edge of the chassis, but comes ⅛ inch further down so it will fit properly in the case.

The chassis side brackets are mounted flush with the chassis bottom edge; this will entail some filing of the mounting holes. The chassis bottom plate is not used.

The panel is fitted flat against the front of the chassis, which necessitates cutting 3 inches off the flange on the mounting brackets. Otherwise there would be a space between chassis and panel.

As noted previously, the beat frequency oscillator control condenser is mounted near the rear of the chassis. It was placed in a small jack shield in the original receiver. Later it was found that the bottom of the BFO transformer case IFT4 should be shielded along with C25, C35, and R11, and a small square shield was fitted over these parts. It would save time to use a single shield of larger size for all components. (Parts list).

The only other large part under the chassis, R33, is bleeder and voltage divider near side.

A word of explanation is needed on the mounting of SW2. This is placed near the socket of V8, to keep the leads as short as possible for highest efficiency, and is fastened to the chassis back. Control is had by means of a copper tube of 1/16 inch inside diameter, through which runs a piece of No. 11 music wire. The tube may be seen curving around the corner of the chassis above R33. The panel control is made from a switch similar to SW1 with the stationary contact points and bakelite plate removed. A hole drilled in the moving contact strip takes the upper end of the music wire. The lower end of the latter of course fits in a hole drilled in the bakelite knob of SW2.

Before assembly, oil is poured in the tube and drained to leave a film inside. The switch really operates quite well; the one precaution to observe is to have both wire and tube free of all small kinks and bends and to make the curves in the tube as smooth and of as large radius as possible.

This is the end of Part 1. The second and concluding article will appear in the April issue and will describe the wiring and circuit alignment.

Parts List

[*Continued from page* 101]

IFT1—455 kc. crystal filter unit (Hammarlund XU-455)
IFT2—Interstage I.F. transformer (Meissner 16-6123)
IFT3—Output I.F. transformer (Meissner 16-6139)
IFT4—Beat frequency I.F. transformer (Meissner 17-6779)
T1—Speaker output transformer (Jensen ZX-1002)
T2—Power transformer 300 volts D. C., 6.3 A.C. (Thordarson T13R15)
CH—Filter choke, 12 henrys at 150 ma. (Thordarson T17COO-B)
Band-Set Dial—Rear illuminated (Millen 10011)
Band-Spread Dial—10 to 1 ratio (National NPW-0)
M-1 ma. "R meter"—Rear illuminated (Triplett 227A)
SPK—8-inch size with 650-ohm field (Jensen ST460)
SW1—D.P.S.T. rotary switch (Centralab 1462)
SW2—S.P.S.T. slide switch (Eby 1011)
SW3—Three position, 2 circuit switch (Centralab 1465)
Case—Par Metal SC-128
Panel—8¾"x19"x⅛" aluminum, grey finish (Par-Metal G-3679)
Brackets—(Par-Metal SB-713)
Chassis—(Par-Metal 15213)
Speaker Case—(Par-Metal SC-1270)
Shield for C27—(National HRO)
3 Isolantite Sockets—Octal type (National-CIR-8)
2 Dual binding posts—(National FWH)
1 Single binding post—(National FWA)
2 Flexible couplings—(National TX9)
9 Sockets—Octal bakelite (Meissner 25-8209)
1 Jack—double circuit
Hook-up wire—R.F. pushback type (Lenz)
11 standard name plates—(Gordon)
8 1⅛" knobs with pointers—(Crowe 591)
2 1⅛" knobs with pointers—(Crowe 590)
1 Bar knob for band switch—(Eby E6844)
Line cord, grommets, hardware, etc.

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All-Purpose Trailer

[*Continued from page* 108]

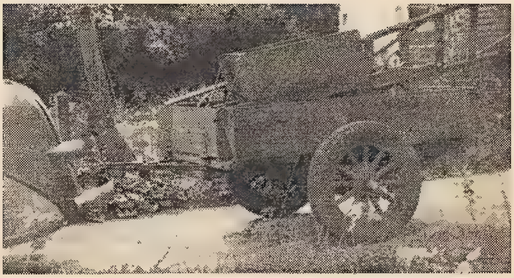
under each plank, they are slipped down over the sides of the box.

The roof adds a valuable asset to this trailer. Anyone who ever hauled furniture in a snowstorm, or who ever arrived in camp with all bedding rain-soaked, will appreciate a roofed trailer. This roof section also uses 1"x12" sideboards, with the front end fastened in firmly with long No. 8 or 10 screws. The back end hangs from the gable-end boards as an end gate that swings up to a horizontal position and fastens with two screen-door hooks. This gives more headroom for entering and leaving the trailer, and for loading bulky objects.

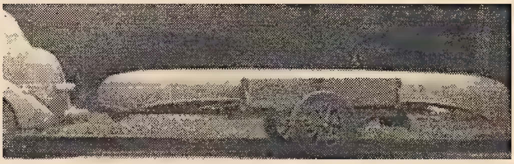
Special lighting conveniences may be installed in this roof section. An outside plug-in of the ten cent type which screws to wood, may be installed on an outside front corner, for connection with either 110-volt current or with a special socket in the dash of the car. Ordinary rubber covered 2-strand 110-volt wire from the dime-store serves as an extension cord. This should not be over 15 to 20 feet long when used from an auto battery.

A small wooden-frame screen about 12"x46" should be made to take the place of the rear end gate. Small screen-door hooks or merely nails slipped into small holes through the sides and into the ends of the screen, hold it in place. When the trailer is used for sleeping, this is a great convenience.

Parking legs will be needed to support both ends of the trailer. They may be made from 2"x4"s fastened with a large strap hinge and a brace of strap iron. The whole arrangement may be folded up under the body and wired, or fastened by more elaborate means. One of the strongest



Here the trailer is being used for the "tough" hauling.



This time the trailer is going on a holiday pleasure trip.

and least troublesome parking legs is made from 1½" or 2" pipe and two floor-flanges as shown in the sketch. These legs are unscrewed and stowed inside the trailer when traveling. The cheaper auto jacks may also be used, and give the advantage of being adjustable in height.

An added convenience for traveling, camping or photography work, is a set of "bookshelves" about 1'x4' to fit across the inside front end of the trailer. They can lift out easily and fasten in place with screen door hooks. These shelves accommodate small articles such as flashlight, cameras, tackle boxes, etc. They may have a 1"x2" strip screwed along the front edge of each shelf to keep articles from sliding off too easily in transit. These shelves also are important when doing photography work in the trailer. If photography work is done at night the trailer will probably be tight enough. Some calking of stray leaks or perhaps covering the rear end with a large blanket may be necessary if films are to be developed safely in the day time. A small portable safelight may be carried to plug in to the electric sockets in both gable ends, or 5"x7" safelights may be used in the gable-end windows.

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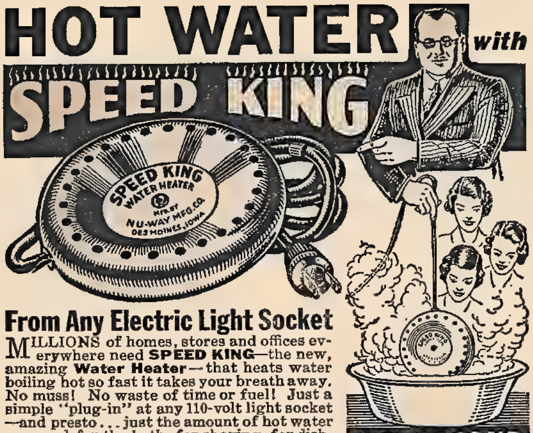

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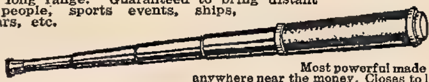

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How To Use Nails

[*Continued from page* 113]

line off the cleat near the center and drive your nails along this line, the displacement of wood particles in the cleat takes place (if the grain of the timber is straight) at each nail at the same grain line. If this displacement is at all great, the cleat is almost certain to split. Following the line of least resistance, which is the grain, this split will reach every nail in the cleat, thereby greatly lessening the efficiency of your work. It is much better to vary the position of the nails in respect to the grain of the timber, thus eliminating the danger of "grain splitting," which is often very troublesome when working with brash timber.

The angle at which nails are set when driving them has a great deal to do with their efficiency. A nail driven at an angle of some twenty degrees less than at right angles to the timber has much greater holding power than a nail driven at right angles. When nails are driven straight into the timber at right angles, the wood particles are usually separated along the grain lines rather than at an angle to them. This reduces very materially the force exerted against the entrance of the nails and consequently effects their holding power. When driving several nails in one piece of timber, as when nailing a cleat to a two-by-eight timber, it is advantageous to vary the angles at which the nails are driven. By so doing, the number of nails necessary to fasten the cleat securely will be much reduced.

Sometimes, in order to have nailing work show more attractiveness, it becomes necessary to drive the nails along a straight line, often with the grain of the timber. When this is necessary, great care must be used to select nails of such length and slimness as to reduce the danger of splitting to rather a negligible quantity. Frequently under such circumstances one can choose timber that does not readily split, thus aiding the cause somewhat. Spacing the nails at distances as great as effectiveness will permit, and driving them at varying angles, will often reduce the danger of splitting. Anyway, it is well to avoid this sort of nailing work as much as possible, employing it only where the work of the nails is secondary to the attractiveness of the job.—*Walter S. Chansler.*

Valentine Hearts

[*Continued from page* 109]

Another pleasing project is the heart design photo mirror also constructed from brilliant plastic. As will be noted from the illustrations a small pocket mirror is built into the plastic heart and exposed on one side, with a favorite picture attractively displayed on the other.

The novelty heart design album differs from the others in as much as it may be made without the use of any shop tools or equipment.

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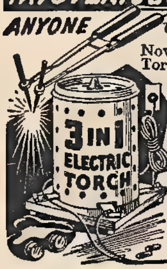

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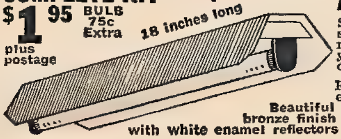

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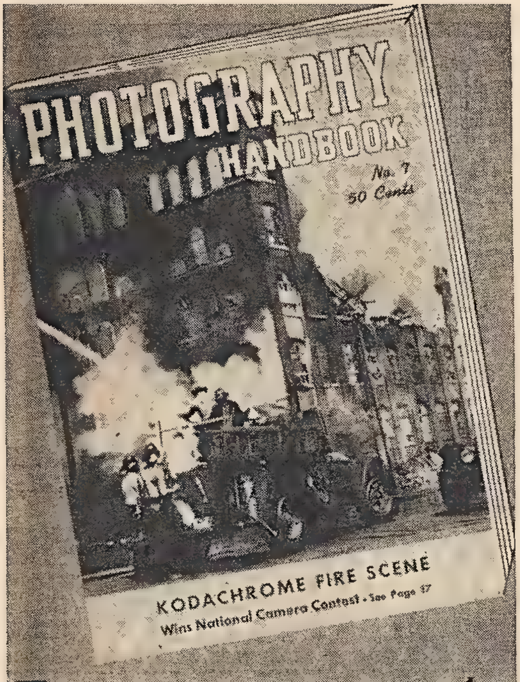

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Prospecting With Black Light

[*Continued from page* 117]

mosphere absorbs all waves below 2850 Angstrom units in length.

For the very best results, there is nothing as satisfactory as the mercury-vapor lamp. A short length of quartz tubing filled with mercury can be bought for about ten dollars, but since it requires a step-up transformer and will be suitable only for work at close range, it would be better to get hold of a commercial ultraviolet lamp, which now can be bought for as little as $24.50. No other lamp fluoresces such a wide variety of minerals nor gives such brilliant effects, and for tungsten, it is an absolute necessity.

If you buy a mercury-vapor lamp, by all means use it with care. Never look directly at the glowing element. Ultraviolet light will injure the eyes seriously, long before you feel any pain. The homemade lamps described offer little danger, yet make it a rule never to look directly at the lamp, as it will only dim your vision to the beauties of fluorescence.

To supplement the minerals you discover in your own prospecting, you can purchase additional specimens or perhaps exchange with other collectors.

To exhibit your trophies of night prospecting, you'll want either a dark viewing box or a darkroom. You can curtain off a small cubicle with heavy drapes, and the darker you make it, the better. The closer you get the source of ultraviolet to the mineral, the brighter the effect will be. A collection is more interesting if each specimen is carefully labelled with the correct name of the mineral and where it was obtained.

You will note, too, that a great variety of other substances have interesting properties when viewed under ultraviolet light. Imitation gems can be detected, for genuine rubies fluoresce a very distinctive deep wine red, while synthetics look much lighter. Diamonds and zircons look quite different under ultraviolet; natural amber fluoresces brightly while bakelite imitations glow little or none. Butter remains yellow under the lamp but margarine turns blue. Many kinds of garden seeds can be sorted because infected and healthy seeds look different. Old bones and teeth fluoresce brilliantly. Ladies shudder when they see how their complexion turns green and their lips a ghastly purple under the lamp.

One last word of caution for night prospectors: If you go out into the desert or the mountains at night wear high boots and be careful what you pick up. Every now and then, some one grabs a lizard or scorpion, mistaking its beautiful fluorescence for a marvelous specimen of scheelite!

MECHANIX ILLUSTRATED will be glad to inform its readers, upon request, as to where flourescent materials and black light equipment are obtainable. Address Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y., enclosing stamped and addressed return envelope.

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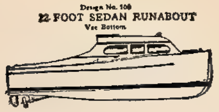
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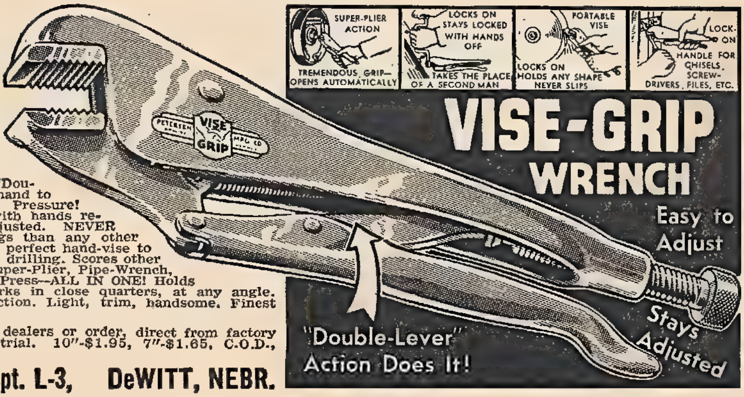
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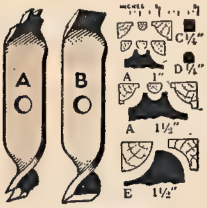

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Attachment For Your Lathe

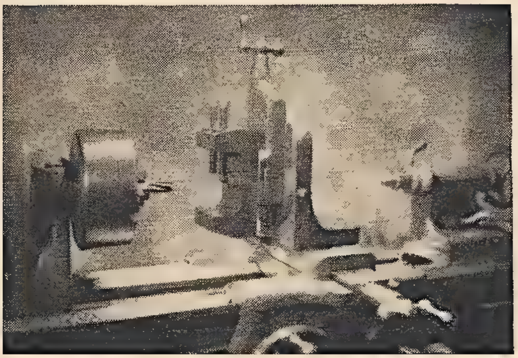
[*Continued from page* 124]

If you do not possess a face and angle plate for your lathe you can machine the other face by placing the finished surface face downward on your marking-out table, or a piece of plate glass, locate center hole in pip print on base and transfer it to a piece of round or square stock securely bolted to the inside of the angle plate at opposite end. This enables you to locate the center hole for your headstock center. After doing this, mount between centers and machine base and pip to fit hole provided for same in your compound rest saddle. Dimensions of the pip with its set screw groove can be taken off the base of the tool holder top slide of your compound rest as this angle plate fits the same hole when top slide is removed.

As we are using your top slide as the elevating and lowering mechanism of the milling attachment, which works just as well as the specially constructed article, we have to provide ways and means of attaching it to the vertical part of the finished angle plate. Set up the finished angle plate on cross-slide saddle, making sure the face is perfectly square with your face plate or driving plate, which presumably, you have already taken a cut from to ensure its running true. Tighten set screws very tight and locate a center midway between the sides of your new angle plate for a hole to accommodate the pip of your top slide. Drill a hole large enough to start a rigid internal boring tool held in the chuck and bore a hole the correct size to snugly fit the pip on the base of your top slide. Next locate, bore and tap set-screw holes on each side of casting to secure pip of top slide when it is put into the hole you have just bored. You should provide pieces of round mild steel slightly smaller than tapped. Set screw holes should be suitably filed, similar to the set screw holes on cross slide saddle of your lathe. This prevents marring of pip on the top slide when it is tightened up to angle plate casting. By laying off one vertical and one horizontal line on casting face to correspond with zero graduation of top slide you will have no difficulty in setting elevating mechanism to any desired angle for special work.

To complete the milling attachment it is now only necessary to construct a suitable machine vise to hold what is to be milled. By referring to the drawing it will be seen that this is also a very straight-forward pattern to make. It is also made of 1" lumber, 5" long, 2½" wide with jaws 2½" from base to top of jaws. It will be noted that both jaw ends are heavier than the balance of the casting which is 1" thick; therefore make jaws 1¼" thick providing a very substantial filet where they join main casting. Casting is machined all over by holding in four jaw chuck placing lathe in back-gear. Locating of set screw holes should be accurately done. To secure machine vise to vertical slide is simple.

It is done in a similar manner to the way the tool holder is normally used, namely, by providing an under plate which engages T slot. To provide against possibility of machine vise moving, a piece of stock cut to exact size of upper part of T slot in top slide is fastened to the back of machine vise by machine screws so it will fit snugly along top of slot when it is tightened up by the short bolts provided for that purpose. Holes for these bolts through machine vise casting should be one size larger than clearing size. When the angle plate, top slide, machine vise combination is set up, the milling attachment is complete. It only remains to take a squaring off cut on the inside of the lower jaw to provide a true working surface.



Milling attachment in position, ready to use. Assembly fits on cross-slide of the compound rest, with top slide acting as moving mechanism.

Casting for angle plate is mounted on the lathe in this manner for machining.

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A Bicycle Drive

[*Continued from page* 121]

the rear shaft hanger at the stern end of the skeg. Make the shaft-log of oak or ash and bolt solidly to the boat bottom. A stuffing-box inside prevents water from leaking in around the shaft. The angle between the two shafts should, of course, be as slight as possible but any ordinary angle will be taken care of by the universal joint. The universal joint can be a piece of heavy valve spring as shown or even heavy duty hose.

Choose the propeller with an eye to efficiency and direction of turn. With the gear line up shown a right hand propeller will be needed. With the gears meshing in the opposite direction a left hand propeller will be in order.

The rudder shown indicates the method of steering. Cut a quadrant of stiff metal to slide down over the oblong top of the rudder post. Connect the ends of the quadrant to the ends of the steering bar by strong cords or small wire rope, leading the lines through eyes or small pulleys on inside of the gunwales. When the handlebars are straight back the boat steers straight. Perhaps a turn-buckle or heavy spiral spring would be advisable in one side of the tiller rope to aid in keeping it tight at all times.

Paint all new woodwork and oil and grease all metal work exposed to water. Pack the stuffing-box with grease. At the same time it will be wise to run some light oil down through the shaft-log hole.

Provision may be made to belt the old sewing machine head pulley to a small generator if so desired. Thus a sailing light could be lighted for night travel.

When your boat is launched take note of how she rides with someone astride the bike seat. If it is down any by the head put sufficient ballast in the stern to give it a good trim and, incidentally, settle the propeller completely under water.

Grasp the handlebars and commence pedaling slowly to gain momentum in the fly-wheel. Then gradually increase the speed until the boat moves ahead at a normal rate for the propeller size and pitch. If there is too great a strain on the legs of the "power plant" reduce the gear ratio of the bicycle. Pedaling backwards will propel the craft to the rear.—*L. B. Robbins.*

Papered Case For Stationery

[*Continued from page* 126]

of these things rests in a compartment of correct size, and on the inside of the lid is glued a calendar and a pocket for a blotter. In order to allow room for the calendar and blotter, the partitions are not quite as high as the sides.

Glued into each stamp-compartment is a block of wood which is triangular in cross-section. This gives the stamp-compartments sloping floor and facilitates picking up stamps.—*B. B.*

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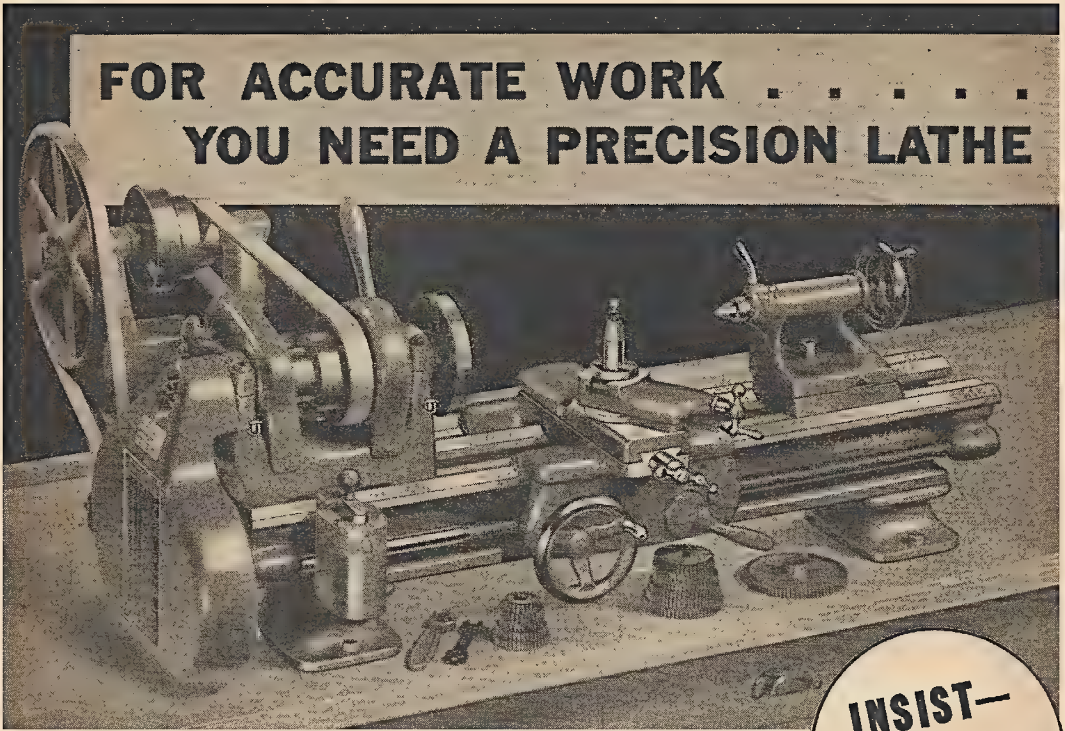

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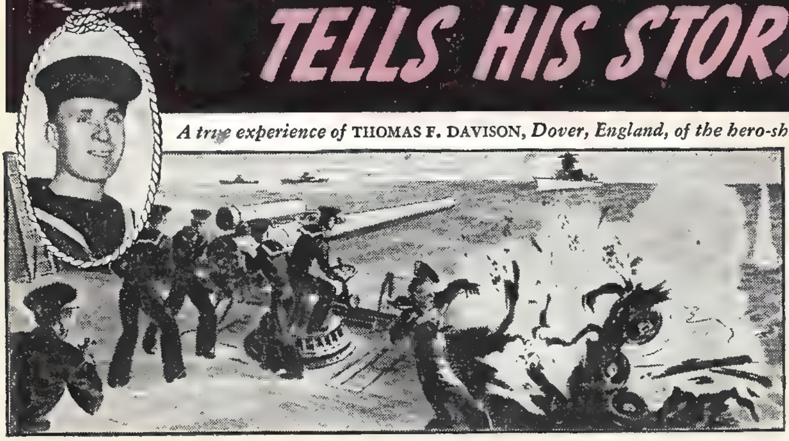
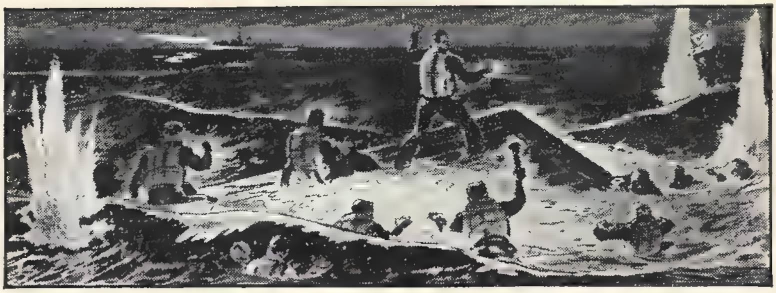
HERO OF "JERVIS BAY" SEA BATTLE TELLS HIS STORY!

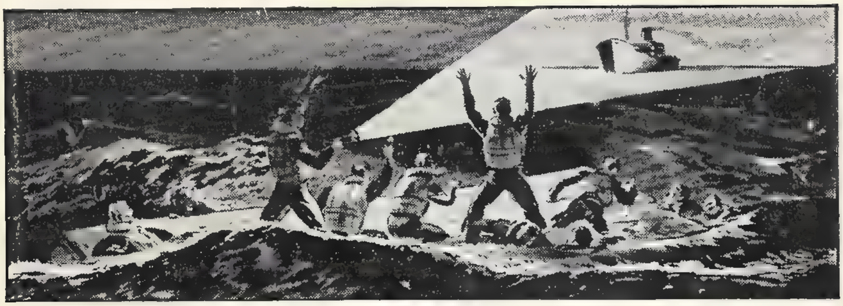
A true experience of THOMAS F. DAVISON, *Dover, England, of the hero-ship,* Jervis Bay.



"PROTECTING A BRITISH CONVOY, the merchant cruiser *Jervis Bay* battled a surface raider to the death," writes Mr. Davison. "Ablaze from stem to stern, we were sinking fast. With others, I dove overboard, clutching a flashlight.



"UNDER DEADLY SHRAPNEL fire, fourteen of us managed to board a flimsy raft. For hours, we sat in icy water up to our chests. Huge waves battered us . . . swept us into the sea. Half dead, we crawled back. Three men died of cold or wounds.

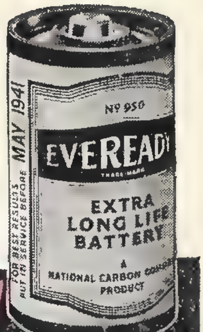


"AFTER ELEVEN HOURS, the soaked flashlight saved us.* The Swedish freighter *Stureholm* saw its beam and picked us up. Without those dependable 'Eveready' *fresh* DATED batteries, we would have died miserably.

(Signed) Thomas F. Davison"

*An "Eveready" Flashlight with "Eveready" batteries, will normally continue to burn under water.

The word "Eveready" is a registered trade-mark of National Carbon Company, Inc.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FOR BEST RESULTS PUT IN SERVICE BEFORE
Nº 950
EVEREADY
TRADE-MARK
EXTRA LONG LIFE BATTERY
A NATIONAL CARBON COMPANY PRODUCT

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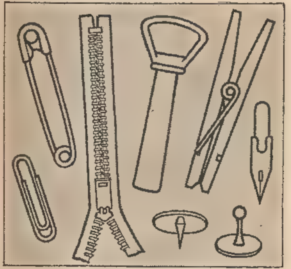

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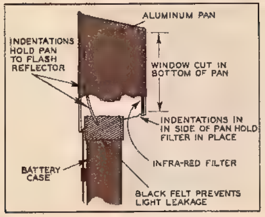

ALUMINUM PAN
INDENTATIONS HOLD PAN TO FLASH REFLECTOR
WINDOW CUT IN BOTTOM OF PAN
INDENTATIONS IN IN SIDE OF PAN HOLD FILTER IN PLACE
INFRA-RED FILTER
BATTERY CASE
BLACK FELT PREVENTS LIGHT LEAKAGE

ABOVE: A high-speed shot by invisible, filtered flash. Subjects and photographer saw no light during the exposure.

LEFT: Detail of the flashfilter unit, in outline. The writer prefers this device to the use of coated bulbs.

ing the flash lamp and reflector behind a light proof infra red screen made of gelatin or solid-dyed glass.

The writer prefers to use a home-built flashfilter unit employing a gelatin filtering screen. It is made in the following way:

Get an aluminum saucepan whose diameter is slightly larger than that of your flash-gun reflector. A 25c pan will be more substantial than the 10c variety. Cut a U-shaped opening in one edge of the pan to make it fit snugly around the top of the synchronizer's battery case—after the latter has been covered with a strip of black felt to make the joint light tight. Now, cut out the bottom of the saucepan to make a "window" for the filter, leaving a narrow rim around the edge to serve as a retaining ring.

A round or flat metal tool (such as the point of a blunt screwdriver) will serve to indent the sides of the pan at several points from the outside. The indentations hold the filter disc in place against the window opening, and permit the synchronizer reflector to be snapped in place tightly inside the pan. Details are shown in the illustrations.

The most satisfactory filter consists of a disc cut from No. 87 Wratten filter gelatin. Sandwich it between two similar discs of glass, sealing the edges with a heavy application of a cellulose household cement (like Du Pont's) to keep out moisture. A filter may also be made by coating a disc of glass with dyed gelatin, the formula of which is given below. Dyed-glass filters, either in squares or cut to order in discs of suitable diameter, may be purchased from the Corning Glass Works, Corning, N. Y. They require considerably more exposure than do the dyed gelatin filters.

Amateur photographers in England have favored the method in which each individual flash bulb is coated with an infra red varnish, the coated bulbs being used in an ordinary reflector. The following formula will be found suitable for coating flash bulbs or the filter glass for a flashfilter unit:

*Eosine, Color Index 768	4 gm.
Tartrazine, C. I. 640	6 gm.
Acid Violet, C. I. 698	4 gm.
Napthaline Green V, C. I. 735	10 gm.
Gelatin (Nelson's Hard)	200 gm.
Glycerihe	100 c.c.
Water, to	1000 c.c.

* Dye sources available on request.

Soak the gelatin for an hour in one-half the fluid volume of water, then warm to 100° F. until it dissolves. Each of the dyes must be dissolved separately in a small quantity of water—the Acid Violet being added a little at a time, dissolving each addition before adding more. The water may be warmed, but to not more than 125°F. Dilute each dye solution with a little of the gelatin solution and dilute the glycerine with an equal quantity of warm water. Mix the ingredients prepared as above, one at a time, and add the remainder of the water. Any air bubbles should be removed by filtering through clean muslin.

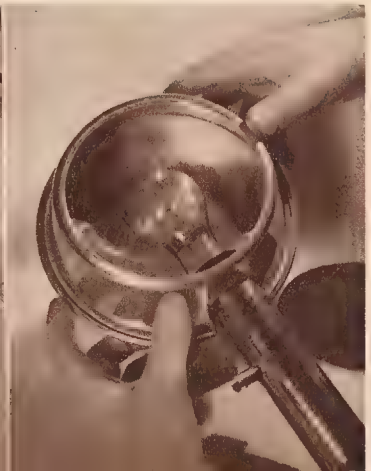
Keep the dyed gelatin solution at 96° F. and immerse the bulbs one at a time. As each bulb is slowly withdrawn, turn it cap downward for a few seconds, then invert it, in order to secure an even coating. Allow the

Alternative method: Dip each flash lamp in infra red gelatin dye solution: then set aside to dry. Flash coated lamps in ordinary flash synchronizers without using flashfilter unit.

bulbs to dry for at least 24 hours before returning to the original containers for storage.

Infra red films are available in a wide variety of types, sizes, and lengths. Du Pont Infra-D comes only in the 35mm size for miniature cameras. Agfa infra red film may be had in 35mm and in various popular

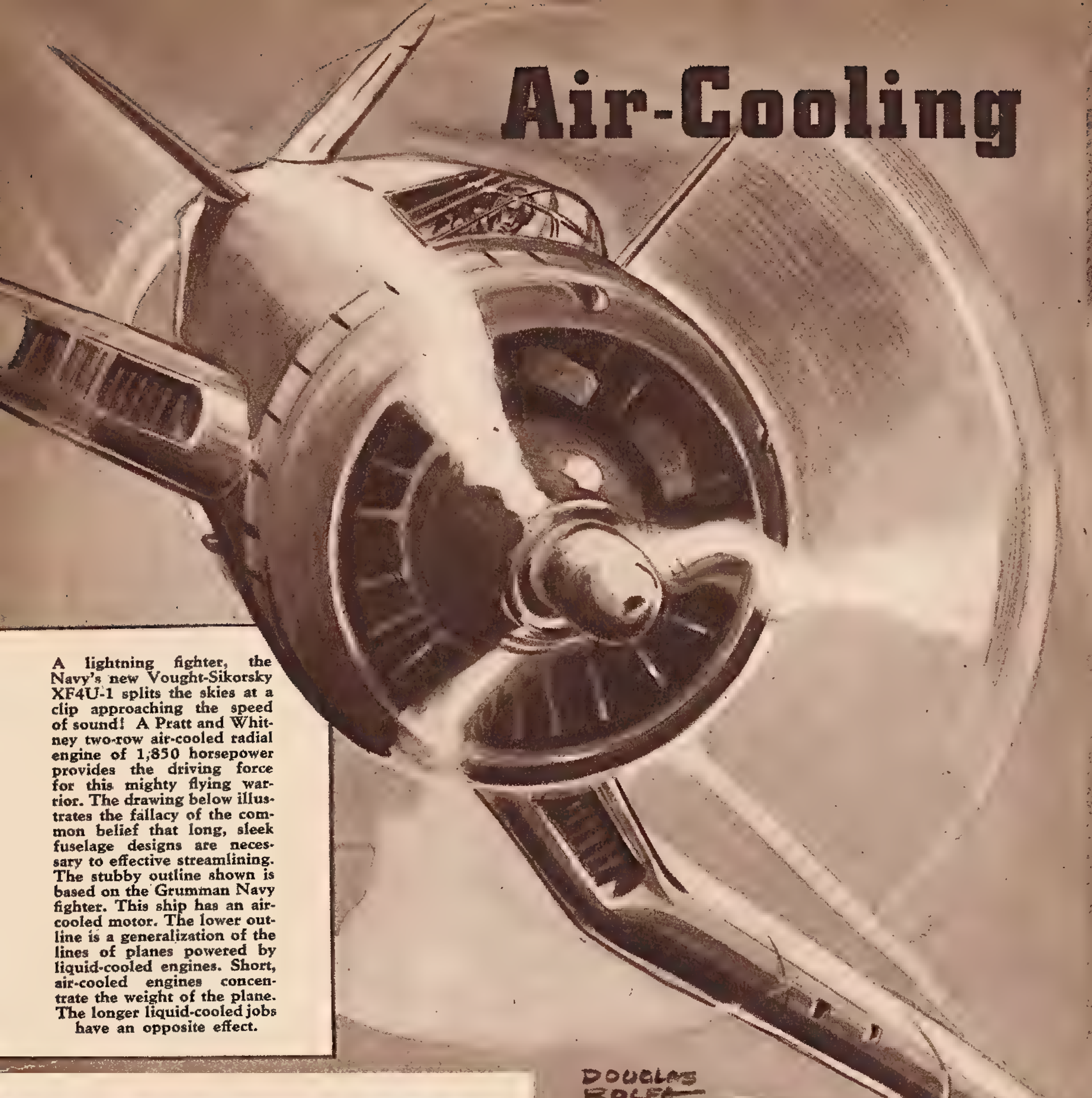
[*Continued on page* 139]



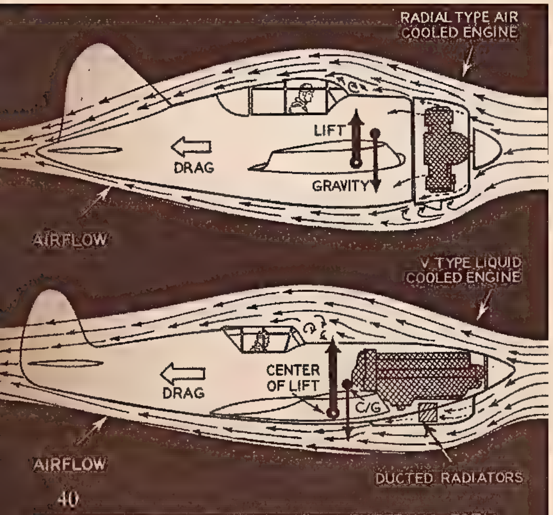
ABOVE: Gap cut into the edge of the pan makes a snug fit around the top of the synchronizer battery case. **RIGHT:** Fitting the cut-out aluminum pan, minus reflector, in front of the flash reflector to make sure that the flash lamp isn't crowded. Black felt strip at top end of battery case makes a light-tight seal with the fitted reflector-filter unit.

ABOVE: Fitting the filter disc into the cut-out bottom of the pan. Slight indentations in the pan hold it in place. **RIGHT:** The improvised flashfilter unit is held to the standard flash reflector by means of indentations pressed into the side of the aluminum pan. The unit may be snapped loose quickly for changing of flash bulbs between exposures.

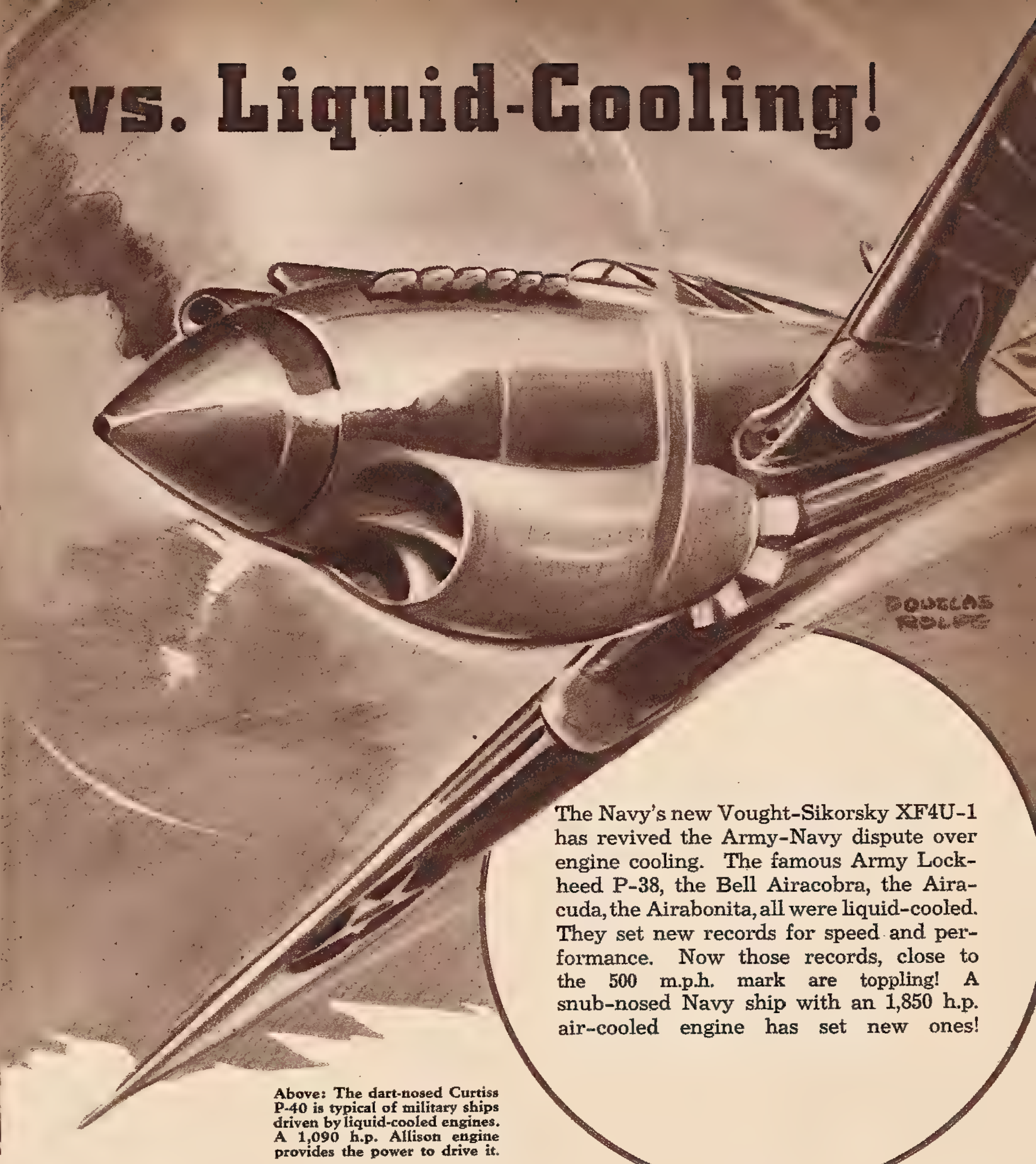
Air-Cooling vs. Liquid-Cooling!



A lightning fighter, the Navy's new Vought-Sikorsky XF4U-1 splits the skies at a clip approaching the speed of sound! A Pratt and Whitney two-row air-cooled radial engine of 1,850 horsepower provides the driving force for this mighty flying warrior. The drawing below illustrates the fallacy of the common belief that long, sleek fuselage designs are necessary to effective streamlining. The stubby outline shown is based on the Grumman Navy fighter. This ship has an air-cooled motor. The lower outline is a generalization of the lines of planes powered by liquid-cooled engines. Short, air-cooled engines concentrate the weight of the plane. The longer liquid-cooled jobs have an opposite effect.



INFLUENCE OF ENGINE DESIGN UPON EXTERNAL FORM



Above: The dart-nosed Curtiss P-40 is typical of military ships driven by liquid-cooled engines. A 1,090 h.p. Allison engine provides the power to drive it.

The Navy's new Vought-Sikorsky XF4U-1 has revived the Army-Navy dispute over engine cooling. The famous Army Lockheed P-38, the Bell Airacobra, the Airacuda, the Airabonita, all were liquid-cooled. They set new records for speed and performance. Now those records, close to the 500 m.p.h. mark are toppling! A snub-nosed Navy ship with an 1,850 h.p. air-cooled engine has set new ones!

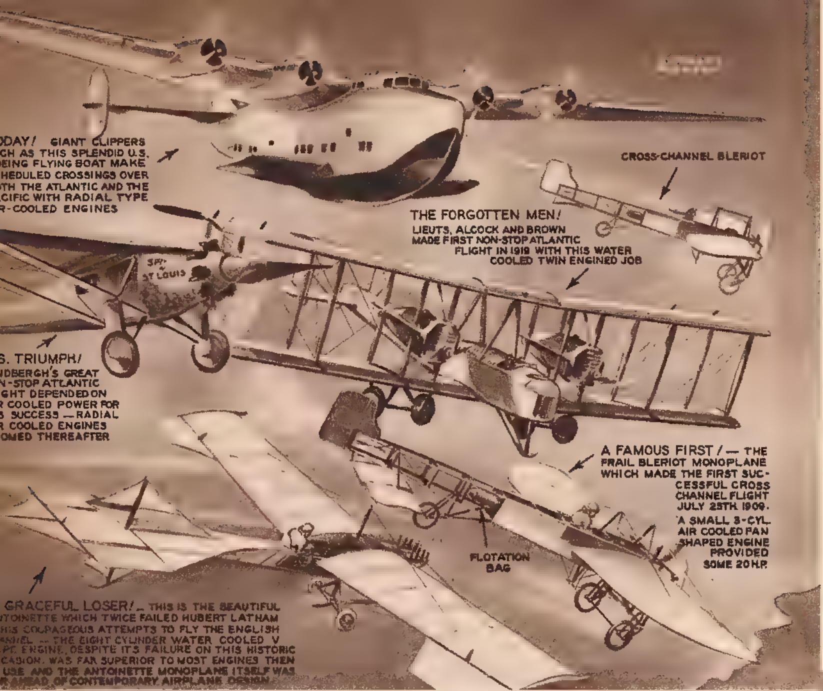
by George Daniels and Douglas Rolfe

NOBODY cared what cooled an airplane motor until Louis Bleriot flew the English Channel in 1909. Louis had spent $100,000 learning to fly, building eleven planes, and having fifty accidents. His trans-Channel monoplane was powered with a 25 h.p. air-cooled Anzani engine. The water-cooled motor that figured in the event belonged to Bleriot's rival, Hubert Latham.

Mr. Latham took off to cross the Channel about a week before Bleriot. He climbed to 900 feet and doubled the official altitude record of the time without batting an eyelash. Then, majestically, he sailed eight miles out over the Channel and fell in—when his water-cooled Antoinette engine quit. Typically British, Mr. Latham sat nonchalantly on the tail of his half-sunk airplane and smoked cigarettes, finally being picked up by a tugboat.

The significant point is that the air-cooled Mr. Bleriot finally made it. After landing behind Dover Castle, he was firmly kissed on both cheeks by some of his countrymen, and taken in town for breakfast. In addition to breakfast, there was the *London Daily Mail* prize of 1,000 pounds. That made air-cooling seem worth while. To cinch it, the water-cooled Mr. Latham made another attempt at the flight and fell in again.

So much for the early history of cooling. The embarrassing thing about any cooling system is the fact that one of its chief purposes is "wasting energy." The average gaso-


ODAY! GIANT CLIPPERS
CH AS THIS SPLENDID U.S.
OEING FLYING BOAT MAKE
HEDULED CROSSINGS OVER
OTH THE ATLANTIC AND THE
CIFIC WITH RADIAL TYPE
R-COOLED ENGINES
CROSS-CHANNEL BLERIOT
THE FORGOTTEN MEN!
LIEUTS. ALCOCK AND BROWN MADE FIRST NON-STOP ATLANTIC FLIGHT IN 1919 WITH THIS WATER COOLED TWIN ENGINED JOB
S. TRIUMPH!
NDBERGH'S GREAT
N-STOP ATLANTIC
GHT DEPENDED ON
R COOLED POWER FOR
S SUCCESS — RADIAL
R COOLED ENGINES
OMED THEREAFTER
A FAMOUS FIRST! — THE FRAIL BLERIOT MONOPLANE WHICH MADE THE FIRST SUCCESSFUL CROSS CHANNEL FLIGHT JULY 25TH 1909.
A SMALL 3-CYL. AIR COOLED FAN SHAPED ENGINE PROVIDED SOME 20 H.P.
FLOTATION BAG
GRACEFUL LOSER! — THIS IS THE BEAUTIFUL
NTOINETTE WHICH TWICE FAILED HUBERT LATHAM
HIS COURAGEOUS ATTEMPTS TO FLY THE ENGLISH
ANNEL — THE EIGHT CYLINDER WATER COOLED V
PE ENGINE, DESPITE ITS FAILURE ON THIS HISTORIC
CASION, WAS FAR SUPERIOR TO MOST ENGINES THEN
USE AND THE ANTOINETTE MONOPLANE ITSELF WAS
R AHEAD OF CONTEMPORARY AIRPLANE DESIGN

Above: These planes of the past and present seem to indicate that both air and liquid-cooling can bring fame. Latham's water-cooled ship set a duration record—1 hour, 9 minutes.

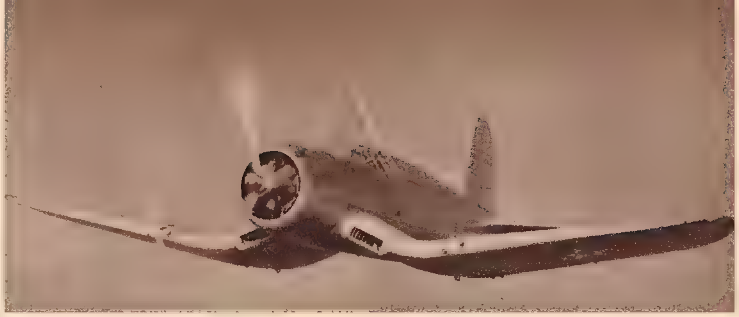
Above: The Prestone-cooled Allison engine delivers 1090 h.p. to Curtis P-40 fighters. Left: 1,000 h.P. air-cooled Wright Cyclone.

line engine is seldom more than 25% efficient. Much of the wanted energy is used to heat the air that passes through the radiator or around the cooling fins. Engine cooling, therefore, is really a matter of finding the best way to waste the energy that engineers don't know how to use.

Just imagine what your electric bill would be if you plugged in an array of electric heaters and tried to keep 1,000 pounds of steel hot all day long—while a giant airplane propeller drove a constant icy blast to combat your efforts! The bill you would receive would give you a clear idea of the energy lost through the cooling system of an airplane engine. Every unit of 746 watts used would represent one horsepower lost. No method is known at present, however, to utilize the excess heat that must be dissipated through the cooling system. Only a relatively small amount of heat is actually needed to maintain the proper temperature in the manifold for vaporization.

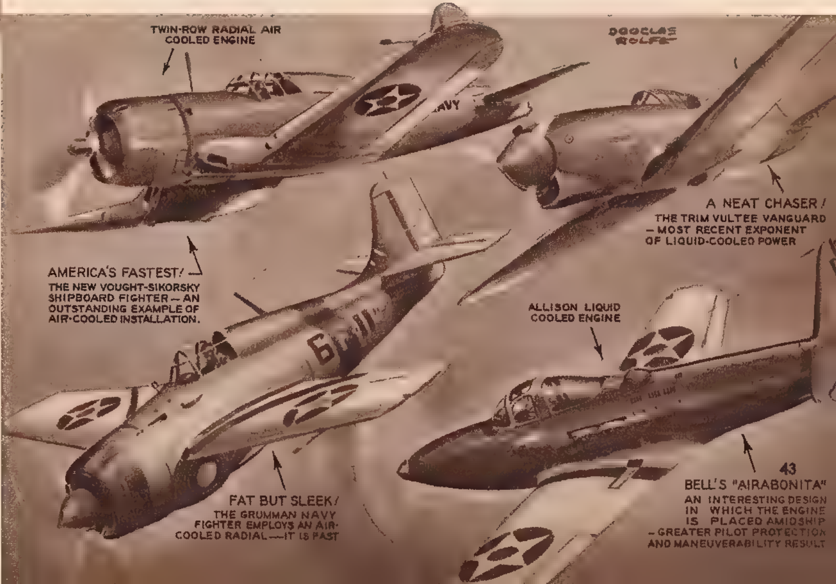
Another fact about liquid-cooling that is seldom mentioned is the improved effectiveness of modern coolants. Certain cooling liquids commonly regarded merely as "anti-freeze," are really more effective coolants than water. Their ability to rid the engine of excess heat with greater efficiency than water, permits the use of smaller radiators. This, of course, reduces the drag of an aircraft in flight. An example of this is to be found in the Prestone-cooled Allison engine used in the Curtiss P-40. Two tiny cylindrical radiators cool the 1,090 h.p. engine.

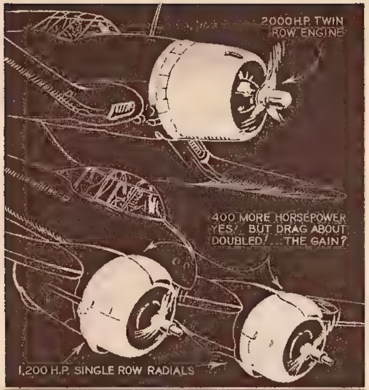
With the super-coolants of today and the resultant reduction in radiator size, fluid-cooling boasts of a definite advantage for military aviation use. The sleek fuselages possible with slender, fluid-cooled motors, afford excellent visibility to the pilot. The only way this can be approached with air-cooled engines is found in the inverted "V" engine, in the inverted tandem, or special fuselage designs. This fact no doubt accounts



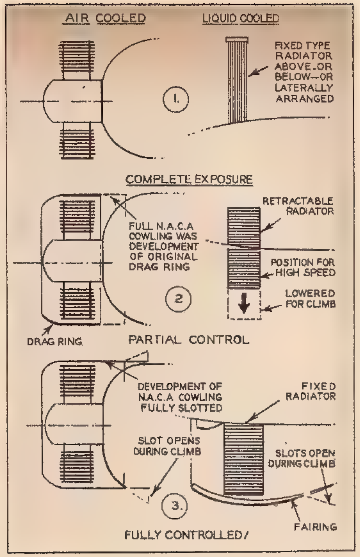
Above: Vought-Sikorsky XF4U-1. It staged a cooling upset.

Below: Cooling systems in modern American war planes.


TWIN-ROW RADIAL AIR COOLED ENGINE
DOUGLAS ROLFE
NAVY
A NEAT CHASER!
THE TRIM VULTEE VANGUARD — MOST RECENT EXPONENT OF LIQUID-COOLED POWER
AMERICA'S FASTEST!
THE NEW VOUGHT-SIKORSKY SHIPBOARD FIGHTER — AN OUTSTANDING EXAMPLE OF AIR-COOLED INSTALLATION.
ALLISON LIQUID COOLED ENGINE
6
FAT BUT SLEEK!
THE GRUMMAN NAVY FIGHTER EMPLOYS AN AIR-COOLED RADIAL — IT IS FAST
BELL'S "AIRABONITA"
AN INTERESTING DESIGN IN WHICH THE ENGINE IS PLACED AMIDSHIP — GREATER PILOT PROTECTION AND MANEUVERABILITY RESULT


2000 H.P. TWIN ROW ENGINE
400 MORE HORSEPOWER YES! BUT DRAG ABOUT DOUBLED!... THE GAIN?
1,200 H.P. SINGLE ROW RADIALS

HOW DOUBLE-ROW AIR COOLED RADIALS SCORE IN EFFICIENCY IS CLEARLY SHOWN HERE — COMBINED FRONTAL AREAS AND RESULTANT DRAG OF TYPICAL TWO-MOTORED INSTALLATION ARE RELATIVELY FAR GREATER THAN SINGLE ENGINE OF COMPARABLE POWER (DRAWINGS IN SAME APPROX. SCALE FOR EASY COMPARISON)


AIR COOLED
LIQUID COOLED
FIXED TYPE RADIATOR ABOVE OR BELOW—OR LATERALLY ARRANGED
1.
COMPLETE EXPOSURE
RETRACTABLE RADIATOR
FULL N.A.C.A COWLING WAS DEVELOPMENT OF ORIGINAL DRAG RING
POSITION FOR HIGH SPEED
LOWERED FOR CLIMB
2
DRAG RING
PARTIAL CONTROL
DEVELOPMENT OF N.A.C.A COWLING FULLY SLOTTED
FIXED RADIATOR
SLOT OPENS DURING CLIMB
SLOTS OPEN DURING CLIMB
3.
FAIRING
FULLY CONTROLLED/

Above: The new XF4U-1 crams nearly 2,000 h.p. in its two-row air-cooled radial. The Grumman Skyrocket uses two single-row engines. Right: Process in adjustable cooling arrangements.

for the popularity of the fluid-cooled engines in current war use.

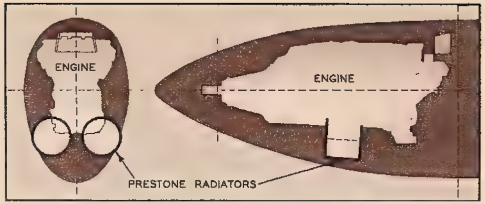
The cooling dispute reached a fever pitch in the last war. German engineers showed a decided preference for water-cooling. A factor that may have influenced them at that time was the difficulty of mass production of air-cooled cylinders. The fins made casting difficult. One well-known motor of that day sported cylinders that had to be machined on a lathe from 90-pound solid steel bars! Improved foundry techniques have made production much simpler since then. The German designers had considerable success with water-cooling. Their motors of 1914 showed great reliability at a time when that quality was none too common in aircraft engines. The clumsy appearance of such famous fighting planes as the Fokker DVII and the Albatross, however, resulted from the requirements of the then bulky water-cooled motors.

The Allies developed both types of cooling. The famous Gnome rotary engine, with its whirling cylinders and stationary crankshaft, was one of the most outstanding air-cooled motors of the war. In common with other air-cooled powerplants, it was very light for its horsepower. Its "flat" design aided in concentrating the weight of the plane, a feature that greatly enhanced maneuverability. The Canton and Unne (Salmson) motor, an unusual water-cooled radial, shared this quality, although heavier. The latter motor established an excellent record for reliability despite the rather complicated problem of water cooling a radial engine. Moreover, it was often mounted horizontally, and geared to the propellar. (See sketch below.)

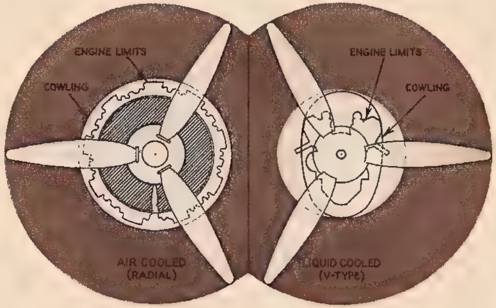
After the war, most American civilian planes were powered with mass-produced water-cooled war plane engines. Among the most famous of these were the Curtiss OX-5 and the world famed Liberty. The former motor was the mainstay of the "barnstormers." The Liberty helped to make history in 1919 by driving the Navy's NC flying boats on their transatlantic flight. Although three of these boats took part in the flight, only one, the NC-4, actually completed the trip. That fact may be partly responsible for the Navy's aversion to water cooling.

On June 14, 1919, water-cooled engines scored a real triumph. Two black cats and their English pilots, Alcock and Brown, sauntered across a field of thick Irish mud after having made the first non-stop airplane

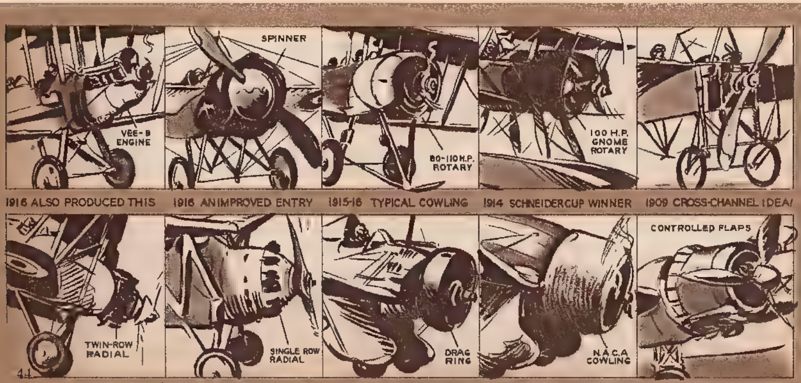
[*Continued on page* 140]


ENGINE
ENGINE
PRESTONE RADIATORS

Above: The use of modern coolants makes small radiators possible. Drawing based on P-40 cooling system. Below: The small frontal area of liquid-cooled engine obstructs less propeller disc area than air-cooled job.


ENGINE LIMITS
COWLING
AIR COOLED (RADIAL)
ENGINE LIMITS
COWLING
LIQUID COOLED (V-TYPE)

Below: Development of streamlined air-cooling of power plants.

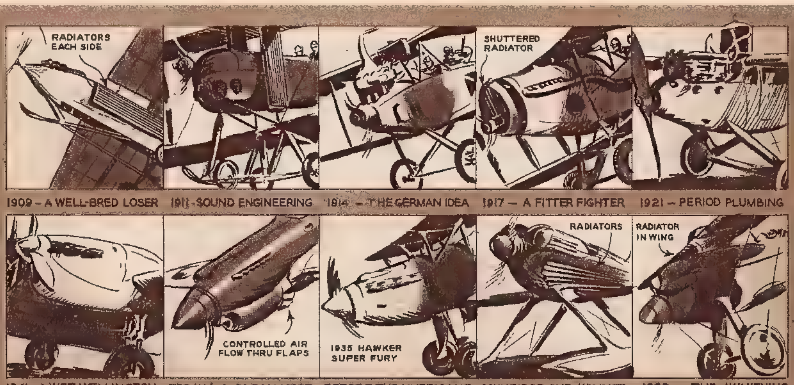

VEE-8 ENGINE
SPINNER
80-110 H.P. ROTARY
100 H.P. GNOME ROTARY
TWIN-ROW RADIAL
SINGLE ROW RADIAL
DRAG RING
N.A.C.A COWLING
CONTROLLED FLAPS

1916 ALSO PRODUCED THIS — 1916 AN IMPROVED ENTRY — 1915-16 TYPICAL COWLING — 1914 SCHNEIDER CUP WINNER — 1909 CROSS-CHANNEL IDEA!

1923 OUT IN THE COLD! — 1923 NEATER AND NICER — TOWARDS THE GOAL! — FURTHER DEVELOPMENT — TODAY—EFFICIENT COOLING

IMPORTANT STAGES IN THE DEVELOPMENT OF AIR COOLED POWER FOR AIRPLANES

Below: How modern liquid-cooling evolved from early types.


RADIATORS EACH SIDE
SHUTTERED RADIATOR
CONTROLLED AIR FLOW THRU FLAPS
1935 HAWKER SUPER FURY
RADIATORS
RADIATOR IN WING

1909 - A WELL-BRED LOSER — 1911 - SOUND ENGINEERING — 1914 — THE GERMAN IDEA — 1917 — A FITTER FIGHTER — 1921 — PERIOD PLUMBING

1941 - A WET WELLINGTON — TODAY! A CLEAN NOSE — BEFORE THE HURRICANE — SCHNEIDER CUP WINNER — 1923 — THE AWAKENING

IMPORTANT STAGES IN THE EVOLUTION OF LIQUID COOLED AIRPLANE ENGINES

Wings Over The Water!

Seaplaning, which used to be exclusively a "rich man's sport," has, with the advent of good, light planes, become something which people of moderate means may enjoy.

Hunters, like those shown at the left, have discovered that seaplanes are wonderful for getting them to the hunting territories and bringing them home.

A THUNDER head was piling itself up against the sunset, but the Aeronca cabin job quickly left it behind and sped south over the coastline—only to be challenged to another race by a creeping white wall of fog as it plunged toward Lake Winnepesaukee at 100 miles an hour.

"Think we'll make it, Bud?" asked one of the occupants of the plane, anxiously.

"Sure, with plenty to spare," answered the pilot. "We'll be at Jack's in about ten minutes."

Ten minutes on the nose and the Aeronca came to rest on Lake Winnepesaukee and slowly made its way toward Jack McManus' seaplane base, where the men waited for more favorable weather before resuming their flight to Boston.

Below, is an NYA-built float at the Downtown Skyport, in New York City. The decks of the floats are painted the standard international orange color and carry the usual black triangle for identification. Floats such as this form a network of seaplane landings that dot the coasts and inland waterways of the country.

These two men were heading home from a week end hunting trip in the woods of Maine. The trip alone, by any other mode of travel, would have consumed most of the week end. Instead, the two men chartered a seaplane at the Wiggins Airways in Boston, flew to Lake Winnepesaukee, breakfasted and continued to Naples, Maine, put in two solid days of hunting, and returned by the same route in time to report to work on Monday morning.

Seaplane operation is striking a responsive chord with the American public, which seems ready and willing to dish out hard cash for the fun of flying on water. The business is equally divided between pilots taking instructions or renting the plane for local flights, and the general public buying $1 joy hops or the $5 scenic rides.

Through the joint CAA-NYA low-cost seaplane base program some 300 floats have mushroomed throughout the country and there will soon be more. The fixed base operators bless the day they left a hot dusty

[*Continued on page* 136]

Seaplanes are a great help to fishermen, too! The man below is enjoying his fishing from a seat on one of the pontoons of the plane. If the fish don't bite, he can up and fly to a new spot!

YOU CAN WIN THESE GREAT PRIZES!

FIRST PRIZE
$1,500 Taylorcraft Airplane

A Taylorcraft plane, an Indian motorcycle, a lathe, and 100 other valuable prizes, to be given away absolutely FREE in the MECHANIX ILLUSTRATED contest!

COME on, boys—it's still not too late! You still have a chance to enter the great MECHANIX ILLUSTRATED contest!

Get in this thrilling contest *today*—and you may win the $1,500 Taylorcraft Trainer pictured on the opposite page, an Indian Junior Scout 1941 motorcycle, an Atlas lathe and accessories valued at $225, or any one of a hundred other amazing prizes valued at thousands of dollars. They're all FREE!

Just look at that plane! Ever see anything like her? A perfect dream of a flying ship, that's what she is! And that motorcycle—why a fellow would give the shirt off his back to own a machine like that! Then look at the rest of these great prizes—that lathe, the Deagan marimba, the boats, radios, camera supplies, and shop equipment.

It's the most astounding collection of prizes ever offered to the readers of a magazine!

BUT here's the swell part of it—you can win one of these great prize's *just by playing a game!*

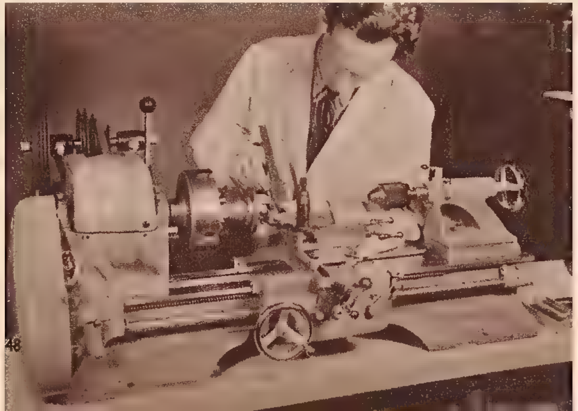
There are no essays to write in this contest, no box-tops to send in, no statements to fill out and no subscriptions to sell! All you have to do is play MECHANIX ILLUSTRATED's fascinating new word game, "Words-Within-Words."

You'll find this month's "Words-Within-Words" game on pages 56 and 57. You don't have to send it in now—just start working on it, and wait for next month's puzzle.

But start working on them *now!* And then get ready for the big closing puzzle in the April MECHANIX ILLUSTRATED!

SECOND PRIZE

1941 Indian Junior Scout Motorcycle



THIRD PRIZE

Atlas Lathe and Accessories

FOURTH PRIZE
$235 Deagan Marimba

FIFTH PRIZE
Midwest Radio, valued at $109.75

Here Are Puzzles Nos. 1 & 2 In The MI PRIZE CONTEST

CONTEST RULES

1. A different "Words-Within-Words" puzzle appears in the February, March and April issues of this magazine. Puzzle Number 2 is on the opposite page. A reprint of Puzzle Number 1 appears on this page, for those who may have missed the February issue. Contestants will complete each of the three puzzles, striving to attain a high score, printing this score in the proper space, marked "Total" on the entry blank. The third entry blank will contain a space to print your "grand total," the total number of points accumulated in all three puzzles.
2. The individual having the largest correct "grand total," as printed on the third entry blank, will win first prize. The individual having the second largest correct "grand total" will win second prize, etc. Duplicate prizes will be awarded in case of ties.
3. Do not send in entry blanks separately. Save blanks until you have all three. Then send them together, by first-class mail, to "Words-Within-Words" Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.
4. Contestants may submit legible copies of the first two entry blanks as their official entry if they so desire. The third entry blank must be the one clipped from the April issue of MECHANIX ILLUSTRATED. (Note: This is permitted because we believe contestants may find it possible to secure a larger score after a little practise, and such practise may mess up the original blank. With that in mind you may want to practise a bit on a separate sheet before filling out the entry blank appearing in the magazine.)
5. Webster's New International Dictionary, Second Edition will be considered final authority on acceptance of words used in the puzzles.
6. This contest closes April 1, 1941. Entries postmarked later than that date will not be considered.
7. No entries will be returned, nor can we enter into correspondence regarding this contest. Judges will be the editors of MECHANIX ILLUSTRATED. Their decisions are final. Anyone in the United States and Canada may compete except employees of Fawcett Publications, or members of their families.

Below is a reprint of Puzzle No. 1, which appeared in the February issue. Contestants may use this blank or a legible copy of it, as an official entry in the contest.

PAR FOR PUZZLE NO. 1 IS 225

PUZZLE NO. 1

								TOTAL
C								
R								
A								
F								
T								
S								
M								
A								
N								
S								
H								
I								
P								
							TOTAL	

CONTESTANTS!

Would you like to have a chance to win a cash prize, as well as one of the regular contest prizes, shown on the preceding pages? If so, turn to page 79 and see how you can win a Cash Sponsorship prize, merely by telling some of your friends about MECHANIX ILLUSTRATED'S great "Words-Within-Words" contest!

HOW TO DO "WORDS-WITHIN-WORDS"

Insert on each horizontal line a single word, of not more than eight letters, the first letter of which is already printed on that line. These letters, already on the puzzle and reading from top to bottom, comprise the KEYWORD. Each word you fill in on horizontal lines must consist of letters appearing in the KEYWORD. Any English word appearing in the Webster's New International Dictionary, Second Edition, may be used, provided no letter appears in your word more often than it appears in the KEYWORD. Example: If "T" appears in the "Keyword" three times, it may not be used more than three times in any one horizontal word. No word may be used more than once in the same diagram. Plurals are permissable.

Method of scoring: Each letter in the finished diagram counts one point the first time it is used, two points the second time it is used, three points the third time, etc. In filling spaces, place letters below and their point value above the curved line as shown in the Specimen Puzzle on this page. Thus, above the first letter of the KEYWORD put the figure 1. Place 2 above the letter the next time it is used, 3 above it the third time, etc. Your completed diagram will show a score above each letter of each word. Then total all numbers appearing in each horizontal line. The total of these figures, is your total for the puzzle.

PAR FOR THIS IS 210

SPECIMEN PUZZLE

								TOTAL
1 M	1 A	1 I	1 N					4
2 A	1 C	1 T	2 I	2 N	1 G			9
3 N	1 U	2 T						6
2 U	1 R	4 N						7
1 F	3 A	3 I	2 R					9
4 A	2 G	5 A	4 I	5 N				20
2 C	6 A	3 R	3 T					14
4 T	4 R	5 I	2 M					15
3 U	6 N	6 I	5 T					20
5 R	7 A	7 I	7 N					26
8 I	8 N	9 N						25
10 N	4 U	11 N						25
3 G	6 R	9 I	12 N					30
							TOTAL	210

A par, or average score, will be given with each of the three contest puzzles. Do your best to beat par!

A careful study of the "Specimen Puzzle" appearing on this page is recommended, as it illustrates the correct scoring procedure.

PAR FOR PUZZLE NO. 2 IS 275

PUZZLE NO. 2

								TOTAL
M								
E								
C								
H								
A								
N								
I								
Z								
A								
T								
I								
O								
N								
							TOTAL	

NAME ....

ADDRESS ....

CITY ....STATE ....

If you were sponsored in this contest fill out the following. If not, leave these spaces blank.

SPONSOR'S NAME ....

ADDRESS ....

CITY.. STATE..................

Save this puzzle and Puzzle No. 1 until you have completed Puzzle No. 3, appearing in the April issue of MECHANIX ILLUSTRATED. Send all three completed puzzles in together.

The boys who make the noise are all set to forget their old tricks and learn new ones for radio's new revolution in the transmission of sound—frequency modulation!

THE SOUND OF THINGS TO COME!

by Jo Ranson and Dick Dorrance

With frequency modulation, tea being poured will *sound* like tea being poured, and not like rain on a roof, or the roar of Niagara Falls.

IT'S not too unlikely that if you attend a radio broadcast sometime a few years from now you may find a sign outside the studio door reading: "Please leave all keys, coins and metallic objects here until conclusion of the broadcast."

And then, if you are wearing a dress shirt front, stiff and starched, you may well be stopped by a courteous usher at the entrance to the studio who will say: "Sorry, sir, no persons in formal dress are permitted at the broadcast."

If you do enter the studio, you will probably find when the program starts that the announcer and other principals use no scripts, or maybe have their lines printed on limp, flexible paper that makes no sound.

Sound, you see, is getting to be a problem in broadcasting. Not only extraneous, unwanted noises, but sound that is a perfect reproduction of the real thing, lending a new depth and reality to radio programs as they are heard in the home.

The reason for all these startling changes and many more in the business of broadcasting is contained in two cryptic letters—FM—which stand for "frequency modulation." That in turn means a new kind of radio transmission which has a whole hatful of much-needed advantages.

Probably there is no single group as excited about the possibilities of FM than the sound effects men. These imaginative gentlemen who are daily called upon to imitate every noise from Niagara plunging over a rocky cliff, to the first peep of a newly-born chick, find that FM offers them an immeasurably better chance to display their talents. FM, you will recall, is the new noise-free, crystal-clear type of radio transmission developed by Major Edwin H. Armstrong, one of radio's greatest living figures (see MI for May, 1940). So great has been the interest of the radio industry in frequency modulation during the past year that at least 200 new stations are expected on the air, operating with FM, before 1941 ends. Because of its complete absence of background "rush" and internal tube noises in the receiver, FM programs come over the air against a background of complete silence. When no music or voices are being transmitted, you cannot tell whether your set is on or off.

The boiled shirt, as worn by this broadcaster, will be out when the acute ear of FM is widely used.

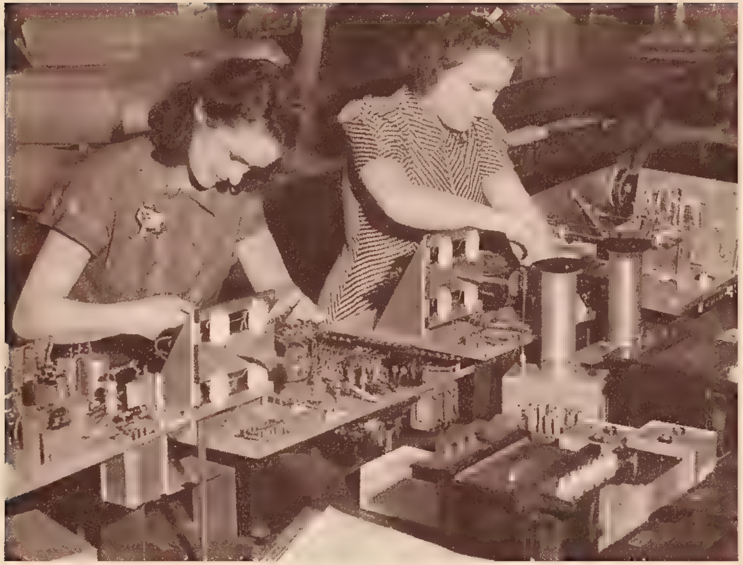
The man at the left sawing wood sounds to the listener of this FM station just like a man sawing wood! Note the "ostrich egg" microphone. Above: Major Edwin Armstrong.

FM possesses a tonal range far beyond that of standard, or amplitude modulation (AM), broadcasting, being able to reproduce all notes from the bassiest 30 cycles up to the extreme treble of 15,000 cycles—a range superior even to that of an excellent musical ear.

But most important for the sound engineers is the fact that over FM things always sound like exactly what they are. If you crumple cellophane in front of the microphone—it sounds like cellophane being crumpled and not a raging forest fire. The tinkle of coins is precise, so much so that you can even tell what denomination they are. Bells sound like bells and not buzzers. A gong clangs, and you hear every lingering overtone in a wavering haze of perfect sound.

The sound effects men have not always had an easy life. Everyone has seen or heard of the peculiar contraptions they are often forced to devise when creating a certain noise to the satisfaction of the radio audience.

The life of the sound effects man, ever a squirrelish existence, promises to be even more unpredictable under the influence of FM. The possibility of whole automobiles rolled into the studio, of gravel walks being built on the studio floor, of real rain falling



Skilled in their work, these girls are wiring power units for a General Electric 250-watt FM transmitter.

from the ceiling—are all lively and likely vistas.

NBC, even now, has 16 "gunmen" in its sound effects department who handle the gunplay for radio skits. It has been necessary for the New York Police Department to issue permits to these men because they use real guns. Despite the fact that blank cartridges provide ammunition, each gun is checked twice before being used in the studio.

The playfulness of sound effects men sometimes extends beyond the walls of the broadcasting station. CBS still chuckles over one screwball who operated a complete sound effects set-up at his home near New York's fashionable Sutton Place. His idea of fun was to come home at two in the morning, roll his loudspeaker up to the window, turn the volume on full—and then simulate a train coming into a station.

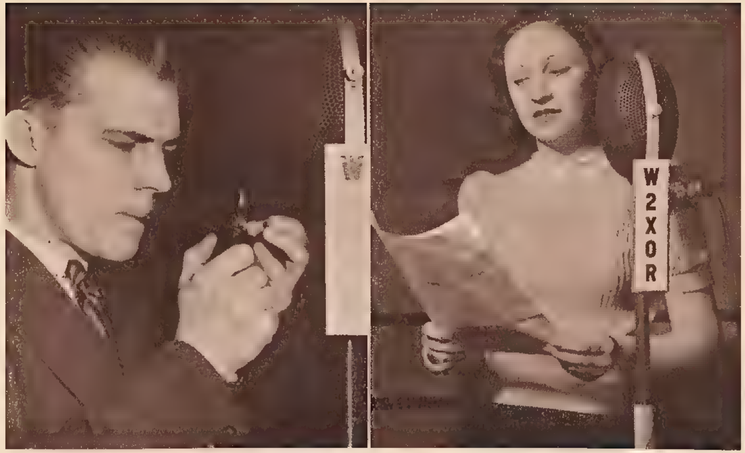
Half-awakened sleepers heard the slowing chug of the drivers, a hiss of steam, a whistle —all in the court of their apartment house. Then a voice would shout "'Board!" loudly, and the mythical train pulled out of the mythical station—leaving the neighbors in near panic.

His other tricks included having a bombing plane apparently dive into the courtyard, engines screaming, then pull up in a sharp dive, followed a few seconds later by the detonations of bombs. A third highly effective stunt featured an auto wreck in the courtyard, with a skid, broken glass and screams. The last item on the program eventually proved so real that it brought two police radio cruisers to the scene.

Listeners are usually rather observant of sound effects on the air. One man—a mechanic—applied for a job at NBC with the following letter: "I have noticed that the gears in the transmissions of all your cars are worn and exceptionally noisy in first and second."

It took the sound men a little while to explain to this individual that if the gears didn't make any noise, the listeners would never know that the imitation automobile was there!

Realism can be carried a notch too far. During a recent Phil Baker program, the necessity for the sound of frying bacon occurred in the script. So the sound men just took a frying pan, some raw bacon, and proceeded to fry it in front of the microphone. It was an audible success — except that the odor wafted up into the air conditioning system and thence all over New York's Radio City!



FM will be alternately a delight and a problem to the sound effects men. A man lighting a match, as the one at the left, will be heard distinctly by listeners. On the other hand, script paper that crackles will be taboo.

After considerable sniffing, executives traced the lunch wagon aroma and immediately handed down a mandate that in future all cooking in the studios—even for the sake of pure illusion—was out so far as NBC is concerned.

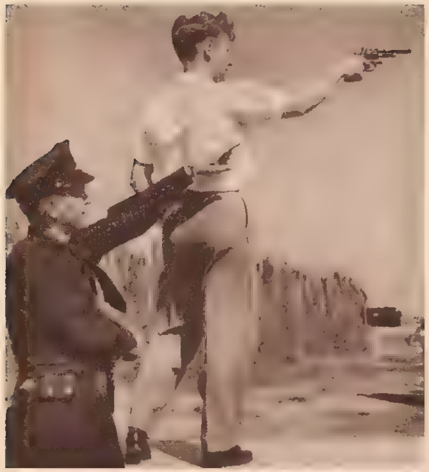
Microphone at New York FM station W2XOR picks up the sound of running water.

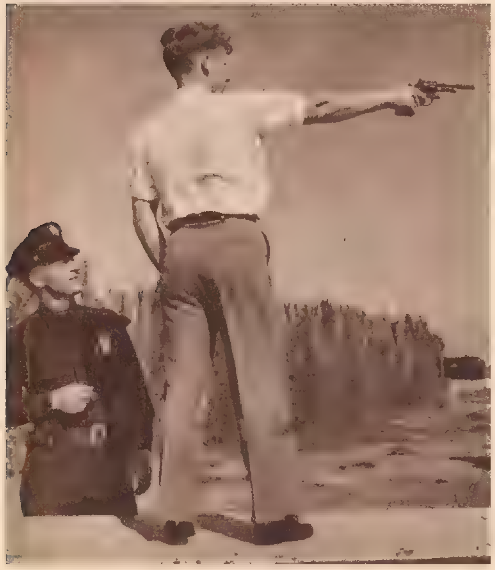
And the business is also fraught with dangers. Recently a noise expert landed in the hospital with a badly cut leg as the result of kickback from a thunder machine. He bumped the gadget accidentally, causing it to swing back and catch him on the leg. The official report was worded: "Wounded on the field of rattle."

Ray Kelly, who is head of the sound effects department at NBC, feels rather enthusiastic about FM. "There is no doubt," he says, "that FM will prove a boon to the sound effects engineer. It will make things a lot easier than they are now. We won't have the restrictions on high audio volume. I'm referring to the explosion sounds that give us so much trouble—such as pistol shots, thunder,

[*Continued on page* 134]

Bullets to The Bull's-Eye!





A rookie learns the right way. The top photo shows him in a wrong pistol-shooting posture, with his right arm bent and his weight thrown to his right foot. The lower picture shows him after the faults have been corrected—the right elbow is straight and the weight is placed evenly on both legs.

Long Beach is training civilians to be crack shots with a pistol in a ten-day "short cut" course. Here's how it's being done!

by Richard W. Emery

TWO hours of study, ten shots a day for 100 shots, and you'll be at least a fair pistol marksman—not ready to break a world record, but a good, solid, safe pistol shooter who can make the bull's-eye look pretty sick!

That's the guarantee of the Police Pistol Club at Long Beach, California, which recently started the first mass training of civilian pistol users on the West Coast.

"It can't be done," several bemedaled marksmen said when the club announced its plan. "It takes months, even years, to learn to shoot a pistol."

After seeing the club's graduates in action, the scornful experts have had to eat their own words!

Using a hurry-up, short-cut course, the club is drilling shooters by the hundreds. The course is based on the psychological fact that habit patterns are formed by the repeating of identical acts over a period of time. It's a high-hat idea, but it's no pipe dream. It was outlined by William C. Wright, Long Beach chief of police, a Texan, who by anybody's reckoning must be classed as an expert pistolman.

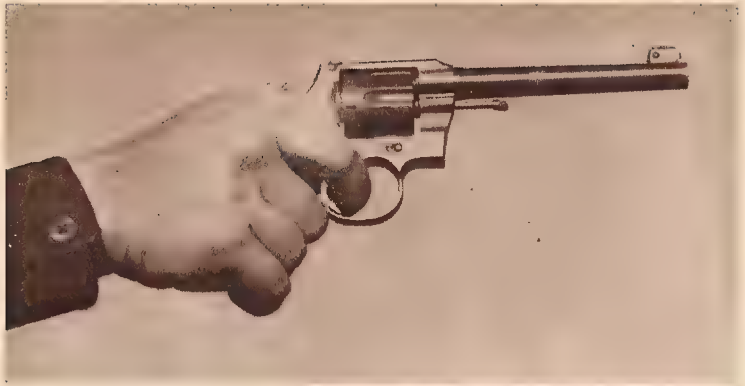
Ten shots a day, in ten days of shooting, will make good pistol shooting form a habit. The marksmen above are using a 25-yard range on the Police Pistol Club course, at Long Beach, Calif. Notice that all of them use the same stance.

Here's the array of targets on the 25-yard range used by the Long Beach marksmen. The targets are about two feet square

The course is being taught by Rangemaster Malcolm McGuire, a tough, stocky, blue-eyed police officer, ex-Navy instructor in the rough-and-ready use of Navy .45's. Sixty marksmen from the police department and sportsmen's clubs are helping out; the lessons are free, and the instructors serve without pay.

Suppose you are enrolling for the short-cut course. You drive to the range on a sunny morning. Already the racket of .22's, .38's and .45's roll from the long gray shed over the firing line. You join other rookies on a bench and you hear McGuire launch into an A B C lecture on pistols.

"If you have normal health and fair vision, with or without glasses, you can learn to shoot in this ten-day course. When you graduate, you won't have the bad shooting habits that handicap untrained shooters. For your first



Here's the proper pistol grip, as seen from the right. The index finger is on the trigger.

Known as the "rookie squint," the one-eye aim shown above is not recommended for marksmen. Both eyes should be open, as shown on opposite page.

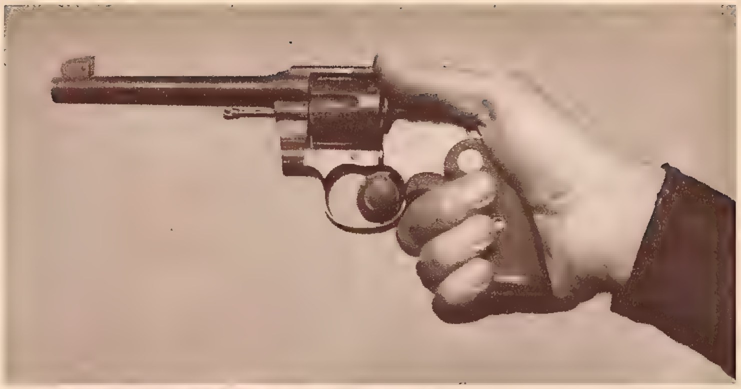
gun you should choose a pistol of moderate caliber, preferably a revolver. You should use shells of mid-range load, instead of high-powered shells, so that you won't develop a flinch from recoil."

Demonstrating as he talks, McGuire shows how the typical beginner, without training, starts out wrong, facing the target square-away, standing off-balance, bending arms and legs, squinting one or both eyes, and otherwise taking positions which will handicap him.

Then he shows you how to stand properly. Your position will vary slightly according to your build; it must be a comfortable position in which you can relax. Your left foot should be at right angle to the line of fire. Your right foot, a half-step away, should be pointing toward the target, or somewhat to your left of the target. Your weight should be borne equally on your two feet, well forward on the balls of the feet. Your body should be erect with head up and left arm relaxed.

"Keep both eyes open and focused on the target," McGuire says. "The pistol, when ready to fire, will lie along the line of vision of your right eye. Your right arm should be straight, but not strained. Only the shoulder joint should move as you sight your gun; the elbow and wrist must not be flexed. That way, the pistol is an extension of your whole arm, easy to aim."

McGuire demonstrates how to hold a pistol in left hand and load it with right hand, always keeping the barrel pointed earthward. The two-hour study ends with an emphatic lecture on safety, covering the standard safety rules on the handling of firearms. He tells you to imagine that your gun is a machine gun, always firing. You must keep it pointed, loaded or empty, where it can't do damage. The safety position for the pistolman is the "raise pistol" position, in which the gun is held at half arms-length, pointed at the sky.



Here's the advised grip, seen from the left side. Note how the thumb is held high against the gun.

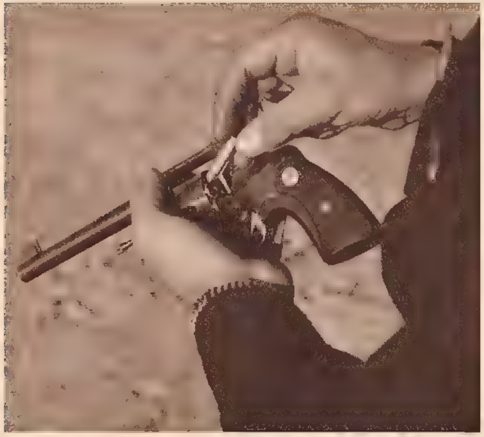
This officer shows the right way to aim. Although only one eye sights along the pistol, both eyes are held open. The high thumb helps to steady the gun.

You and the other rookies now take firing positions on the target range, facing targets 25 yards away. The targets are about two feet square with bull's-eyes as big as saucers.

Your first firing is "dry firing" with an empty gun. Over and over again, while instructors watch your position and correct your faults, you pick up your gun, keeping its barrel pointed out toward the target; fit the gun into the grip of your right hand, take your stand in firing position, and keep your aim all the way through a careful three-or-four-second squeeze on the trigger.

"Don't try to fire at the precise instant when the sights are aligned on the bull's-eye," McGuire warns you. "The jerk will throw your aim off. Keep your aim as best you can and gradually squeeze the trigger; your accuracy will be much better that way and will improve with practice."

Finally you load your gun. You repeat the aiming and trigger-squeezing; the gun barks, the sharp recoil lifts your hand—and presto!



Correct position for the gun in loading. Barrel points down; left hand grips the gun securely around the trigger guard.

A tiny black mark appears on the target! You place the gun on the table and relax your arm for one minute before trying again. In that manner you take nine more shots, finishing Lesson No. 1. Instructors take care that your position is correct for each shot.

Those ten shots are a minimum for each lesson, not a maximum. Shoot more if you want, but make sure that you shoot in proper form, squeezing the trigger. After the second or third lesson, have someone else load your gun, half with empties and half with loaded bullets.

If you are developing an unconscious flinch at recoil, a very common fault which handicaps almost every beginner, this stunt will help you to correct your ways.

There is no reason why anybody with fair vision can't learn to shoot a revolver properly just as easily as the civilian students at Long Beach's Police Pistol Club.

Just remember the rules: Start off with mid-range load shells rather than high-powered shells; stand erect, with head up, left arm relaxed, and your weight evenly distributed on both feet, with the right foot pointing toward the target and the left foot, half a step back, at right angles to the line of fire.

Keep both eyes open and focused on the target; have the right, or shooting arm straight but not strained; move only the shoulder joint when you sight the gun; take three or four seconds to squeeze the trigger after getting your target sighted.

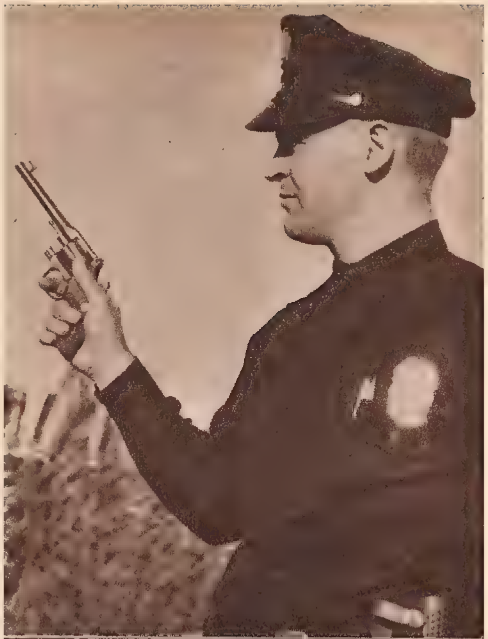
As you gain experience you will develop an "easy" mental and physical attitude when shooting. A tense, nervous posture is one of the outstanding drawbacks common to amateur marksmen. The tendency of many beginners is to "jerk" the trigger the instant the sights find the target. This hasty firing defeats the purpose the marksman is attempting to achieve. The pistol is far less likely to wander from its intended mark if fired in a more deliberate manner. Much time can be wasted by starting wrong.

Above all, remember the rules of safety—gun pointed earthward or skyward when not being aimed at the target!

If you correct your form by careful adherence to these rules and by studying the pictures on these pages, you will find when you finish your ten days of shooting, that you'll be shooting in good form.

You'll be putting bullets in the bull's-eye!

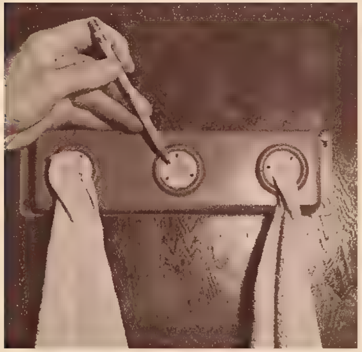
The entire Long Beach city council enrolled in the Police Pistol Club's classes for civilian shooters. The councilmen, city manager and chief of police are shown here as they inspect the police instructors.



The safety position for the pistolman is the "raised pistol" position shown above, in which the gun, at half arms length, is pointed skyward.

Choosing the right type of gun is important. Pupils of the course are shown various types of pistols and are helped in their selection of a gun. The upper gun shown is a .45 Colt automatic, the lower a .38 Colt revolver.

Thirty-two ties can be hung on this four-tier rack, which measures only four by nine inches, and swings outward when ties are needed.



Whyman's newest gadget is the towel holder, shown above. You simply press the corner of the towel into the center of the slotted rubber disc. Below, a rubber band pistol being used on a trick target; the squirrel jumps when hit.

call your firm the 'Gadget Manufacturing Company.' "

The engineer set up shop in Los Angeles' industrial district and began seeking items. Scores of inventors knocked at his door, and one day two women laid a spatula on his desk. It resembled an ordinary flapjack turner, but when Whyman pulled a trigger two leaves flew out sideways. "That," explained the ladies, "enables the cook to lift meat loaves, soft-crusted pies and fowl."

After trying the gadget at home, Whyman made a few improvements, and it wasn't long before 50,000 housewives were flipping the leaves out and slipping the triple-bladed contraption under foods which formerly crumbled when they were lifted from the pan.

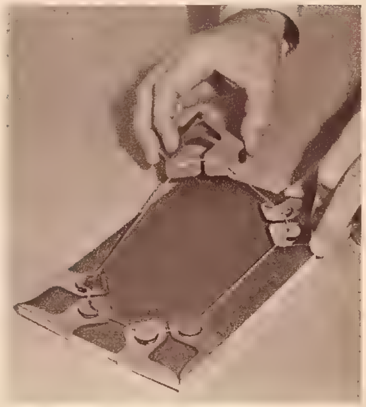
What spells success for a gadget? There is no sure fire rule by which sales may be gauged, Whyman tells you. Public acceptance is fickle. They may buy hundreds of thousands, or turn a new item down cold. Each is a gamble.

After analyzing, figuring costs and discussing the possibilities of improvements on several thousand ideas, Whyman has hit only three or four which really proved profitable. He keeps his door open to inventors, always hoping to see the "one in fifty thousand," which will click in a big way. By that, he means something which will sell a million copies a year for five or six years.

Often one gadget leads to another. Some months ago, he turned out several thousand small repeating rifles which shoot elastic bands. Made of 10 parts, including a wooden barrel painted black to resemble metal, one gun takes four rubber bands fitted over a notch in the muzzle and stretched back to a four-pronged ratchet which is rolled back one-quarter of a turn to cock the piece. When the trigger is pressed, the ratchet flies back a quarter-turn, releasing one band.

Above is a corner of Whyman's "Arsenal." Made of ten parts, 100,000 of these realistic guns were manufactured in twenty days. At the left is a closeup of the gun, showing how it is "loaded" with ammunition—rubber bands.

Below: The framette—four pressed corners are held around a picture by an elastic band.

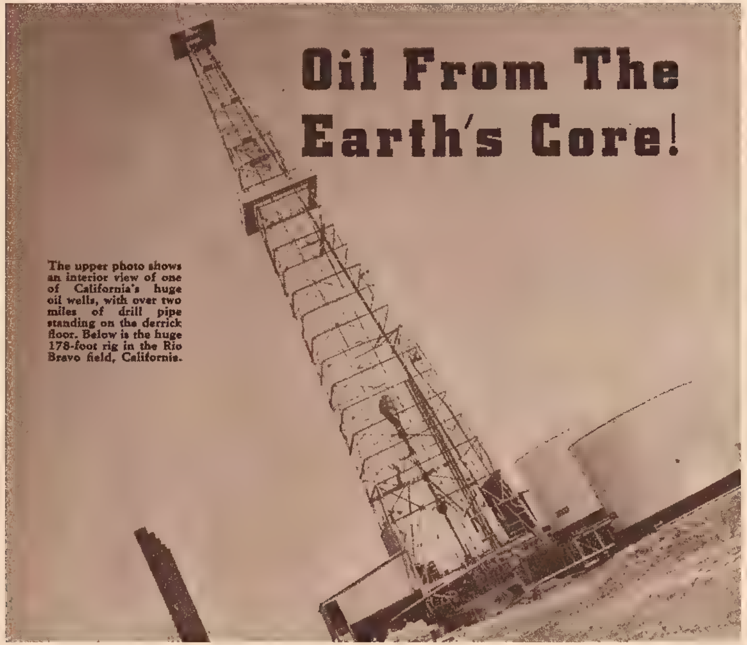


They sold well enough, but Whyman wanted to stimulate interest among grown-ups as well as children. Shortly, he perfected a throwing device which sails four-inch paper plates across the room. These consist of a metal arm fitted with metal fingers, and apparatus for holding the upper end of the arm back in the firing position. By pressing a trigger, the arm flies forward. Thus was born the game of parlor skeet, and soon afterward he turned out 100,000 repeating rifles during 20 working days. "This sort of game appeals," according to Whyman, "because Dad and the kids can compete indoors on cold winter nights without danger of injuring anyone. The bands are accurate for 20 feet, and a youngster with practice can hit the plate four times in five."

Most inventors fail to consider production

[*Continued on page* 146]

Oil From The Earth's Core!



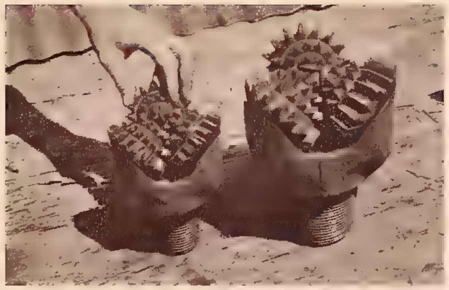
The upper photo shows an interior view of one of California's huge oil wells, with over two miles of drill pipe standing on the derrick floor. Below is the huge 178-foot rig in the Rio Bravo field, California.

AMERICA'S vast defense program is swinging into high!

Planes, tanks, armored cars and truck transports are rolling off assembly lines; submarines, destroyers, cruisers and dreadnaughts are sliding down shipyard ways into the water; arms factories are working on 24-hour shifts to supply the rifles, cannons, machine guns and mortars to arm our nation's manpower.

For all these things there is one essential operating ingredient—oil! Oil to power the great diesels; oil to lubricate the guns; oil to furnish the gas to run the planes and motors.

We have oil, yes. The American Petroleum Institute estimates nearly 18,500,000,000 barrels of oil are in reserve through known fields in eighteen states. But we're going to need more. Experts estimate that in the event of war the navy's requirements alone would jump from 9,000,000 barrels of fuel oil, produced from 36,000,000 barrels of crude, to the staggering figure of 50,000,000 barrels of fuel taken from 200,000,000 barrels of crude!



Above are rock bits, revolving grinders that are used when the going gets tough for the drill.

Brother, that's oil!

And it's why there are now nearly 4,500 drilling rigs in operation seeking new supplies. It's why more than 25,000 wells or more will be completed this year. It's why men in Texas, Oklahoma and California are drilling down, through the Miocene and Eocene sands, boring farther toward the earth's core than man has ever before gone, in an endless search for the new fields of liquid "black gold" so vital to our needs.

Rearing its crown block 178 feet above the floor of San Joaquin valley, not far from Bakersfield, California, the world's tallest oil rig spins its drill at 750 revolutions a minute in search for oil. Powered by steam generated in five 130 h. p. boilers, the bit of the drill can make more than 650 feet a day. So powerful is the machinery, this rig is capable of reaching a depth of 17,500 feet, nearly a half-mile deeper than the deepest drilling ever made before. Because of this

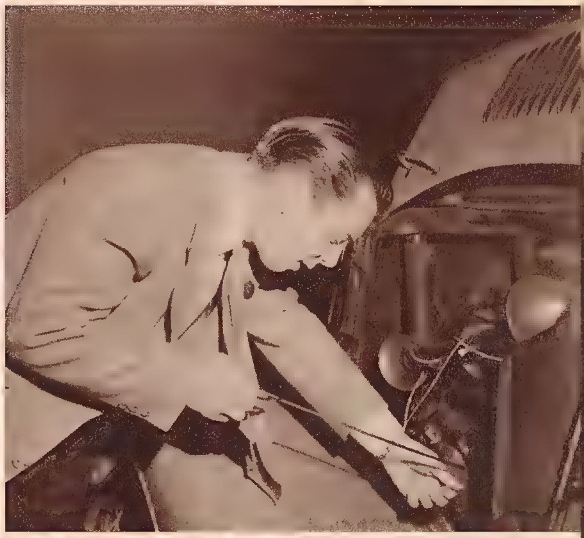
[*Continued on page* 138]

Above: Five 130-horsepower boilers operating under pressure of 500 pounds per square inch supply power to turn the drill. Below: By keeping watch of these dials, the driller can tell exactly what is happening to the drill end, far below the surface of the earth.

How To Buy A Used Car

by Rory O'Shane

Don't get stung on a used car! This article tells the simple tests you can make to detect a lemon!



Examine the oil on the measuring rod. If it is unusually heavy it has probably been used to hide motor knocks. Drain it and replace with a normal grade of oil.

Run the car on to a lift to examine the under parts. If the muffler has a piece of tin wired around it, replacement will undoubtedly be necessary.

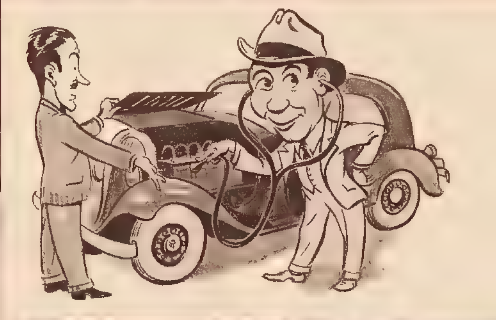
TEN million motorists have never owned a new car. Those who bought their "second-hands" without knowing a few practical rules generally had to shell out hard-earned cash for repairs or replacements.

Although the majority of used car dealers are fundamentally honest, the used car market is essentially a "let the buyer beware" proposition. The careless buyer often falls heir to a car that has had the cream of its performance value removed, leaving a burden of worn tires, bearings, slipping clutches, and defects ad infinitum.

A wise thing to do is to steer clear of slick looking paint jobs. Though logically a carefully protected interior should denote the same condition for the rest of the car, a new paint job in this situation is a camouflage for abnormal wear, tear, and abuse.

In the interest of safety it is important not to buy a rebuilt "wreck." The car may have regained its original contours and finish, but hidden structural

Note that the lower corner of the door shown above has been sprung out of line—by a crash, perhaps.



Check battery with a hydrometer. Heavily charged, it may have a dead cell.

Collision necessitated this radiator replacement. Numerous new parts may tell tale.

Uneven front tire wear is evidence of bad alignment or worn steering mechanism.

weaknesses are apt to appear at dangerous moments. No amount of ingenious body work can restore strained motors and frames to their initial strength.

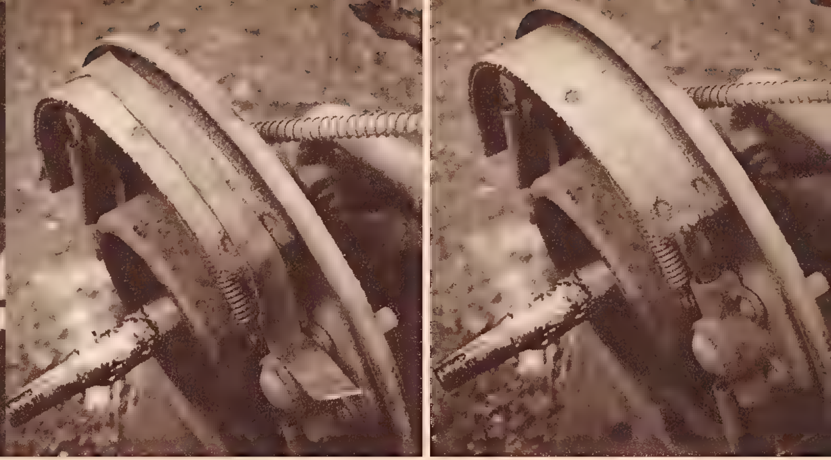
Putting your finger on a rebuilt "wreck" is not difficult. Replaced radiators, fenders, bumpers, and running boards are the danger signals. Doors that sag, or open and close with difficulty indicate that the frame has been sprung. Some mechanics raise the hood and examine the braces that run from the top of the radiator to the back of the motor. The force necessary to bend or twist these is evidence that the car has been in a severe collision if bends are present.

The best procedure is to run the car on a hoist and examine the frame. Nothing the dealer can do will hide weld marks underneath the car. Bluish patches on the frame are signs of a heat straightening process. Where the frame has been cold straightened, you can see the marks of the press.

While the car is elevated, you might take a glance at the muffler. Wrapping a sheet of tin around a broken muffler is an old trick, but quite effective.

The life of a tire is roughly 30,000 miles. Therefore if the tires are fairly new but of different makes, you can safely estimate a car mileage figure of over 30,000 miles. Another reason for the different brands may be that the former owner was too hard on the original tires. If so, he probably was hard on the motor also.

Removal of the cylinder head may reveal presence of graphite and paraffin compound.



Above Left: A brake band whose action has been faked with strip of inner tube.
Above Right: A brake band that has been worn down to the brass rivet heads.

The fact that the tires look brand new is not conclusive proof that they are. Retreading or recapping processes cut beautifully new grooves into bald or worn tires and are inexpensive for the dealer. But such tires are dangerous at high speeds and will have to be replaced shortly.

You can spot a retread by looking for the faint impressions of the original tread, or by the fact that the new grooves do not extend clear to the outer ridges of the tire. Recapped bald tires are distinguishable by their extremely thin treads.

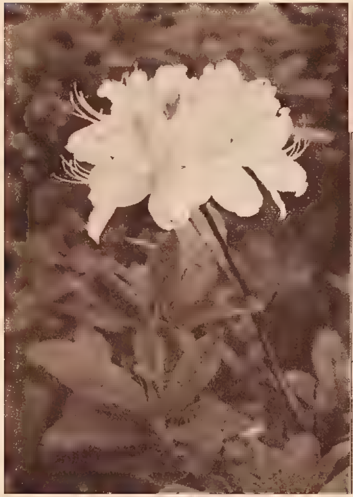
If the front wheel tires have treads worn more on one side than the other, the trouble may be incorrect wheel alignment, broken springs, or a bent tie-rod.

This differential has been made to run quietly with sawdust in grease.

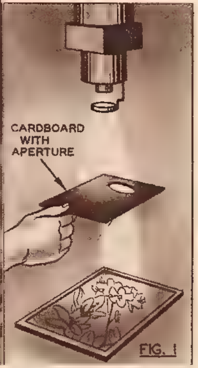
Shake the wheels from side to side. If they wobble noticeably, they need a rebushing job. Worn out bushings will also cause the front wheels to "shimmy." Unscrupulous dealers may rectify this condition by pouring sand into the bushings and king-pins, so have a front wheel removed and look at the bushings for traces of sand. Before turning on the ignition, step on the starter button and keep it going for about ten seconds. This is long enough to hear the b-r-r of broken starter teeth.

Use a hydrometer to check the battery. Quite often the dealer will put a highly charged battery with one dead cell in the car to save himself a few dollars. His idea is

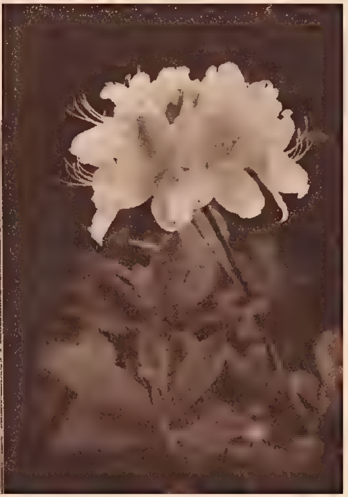
Print "Dodging" in One Easy Lesson

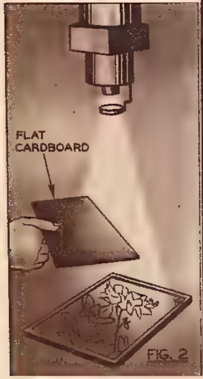


LEFT: Background detail is distracting in this straight, undodged flower "portrait." BELOW: Local printing. The petals receive additional exposure from the light passing through the hole.



RIGHT: Dodged print from the same flower "portrait" negative. Note how the petal detail has been accented by local printing. Background detail was dodged in by the method shown below.





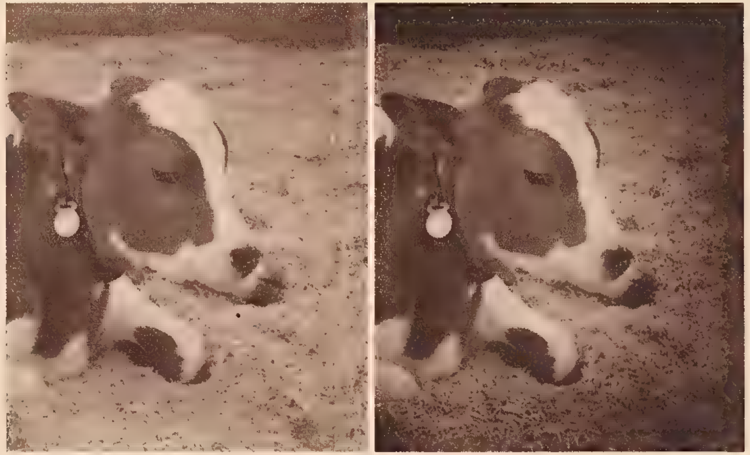
by

Flora K. Howes

EVERY amateur photographer has negatives which would make excellent salon enlargements if only something could be done about their light backgrounds and their spotty, distracting foregrounds. Light areas and unwanted details draw the eye away from the principal subject of the picture; they weaken the composition.

The only answer is dodging or local printing, or a combination of both. Many references are made in photographic literature to these two standbys. Just what does each operation involve? What tools are needed? Is it hard or easy?

Dodging and local printing are easy if you are patient. It takes nothing more than a knack to master them. Figure 1 is a rough sketch of the local printing operation. After the print has been normally exposed to the enlarger light, a cardboard with a circular or oval hole or aperture cut in its center is placed between the enlarger lens and the paper. The printing light is permitted to pass through the hole in the cardboard to the part of the picture area that needs darkening. There may be one or several such areas. When an area that is to be printed locally is fairly large and at the edge of the picture area a solid cardboard sheet is used as in Figure 2. The portions exposed to the unimpeded printing light are darkened here again.



ABOVE LEFT: "Straight" print and, ABOVE RIGHT, dodged print from the same negative. Fig. 3, RIGHT: How the dodging was done. The printing light flows around the cardboard disc, thereby darkening the marginal areas and leaving the head and shoulders of the principal subject as they were in the straight print. Darkening of spotty foreground and background detail accents the main interest—strengthens the composition.

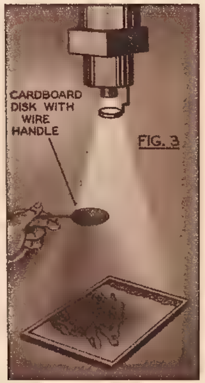


Figure 3 shows how dodging is done. The position of the cardboard disc between the enlarger lens and the printing paper is controlled by the thin wire handle. The areas over which the disc is held are "held back" while all surrounding areas are darkened.

In all three instances the dodging or local printing medium must be kept moving continuously either up and down through a short distance or a little to each side of the area concerned. This prevents the formation of sharp demarcation lines between the areas receiving additional exposure and those that don't. The normal position of the dodging or local printing board is about midway between the lens and the paper easel.

Let's consider a typical example, the case of the rhododendron "portrait." Use of a portrait lens from a close-up camera position threw most of the background detail out of focus. However, light areas from adjoining blossoms nearby continued to distract the eye when the enlargement was made in the usual way, and the petal detail was slightly washed out. On the basis of test strips made for the various

[*Continued on page* 144]

"Darkroom Spot" For Print Inspection

Print in hypo solution under the "Darkroom Spot."

by Arthur Trauffer

SUSPENDED above the hypo tray, this lamp will enable the photographer to inspect his prints while they are still in the hypo and without any danger of fogging sensitized paper that happens to be lying open in the darkroom. The spot of light produced is confined to the hypo tray and is adjustable for both diameter and intensity. Control is accomplished by changing the position of the bulb within the lamp tube, and by raising or lowering the lamp proper.

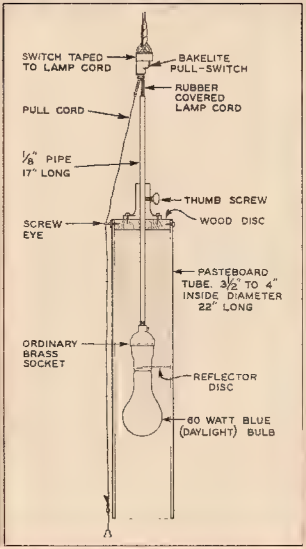
An added feature is the use of a blue (daylight) bulb in the lamp. The spot of "daylight" directed into the hypo tray closely approximates natural daylight. It will give one a reasonably accurate idea of how the prints will look when they are dry and viewed in natural daylight (taking into consideration, of course, the fact that most papers darken up a bit in drying).

The lamp is turned on and off by means of a pull-chain switch, connected to the drop-cord by which the lamp is suspended. A pull-cord is tied to the chain of this switch and the cord is hung within easy reach of the hypo tray. All parts necessary for the construction of this inspecting-lamp are easy to obtain, and should not amount to more than $1.35 all told. These are:

Pasteboard or cardboard tube, 22 in. long, inside diameter 3½ in. to 4 in.
⅛-in. iron or brass pipe, 17 in. long.
Supply pipe bracket, or flush-pipe bracket (flange only).
¼-in. thumb-screw, 1⅛ in. overall length.
Hardwood 5 by 5 by ¾ in.
Ordinary brass-shell lamp socket (plain, without switch).
22 gauge sheet metal, 5 in. by 5 in. (not aluminum).
Six nickel-plated, round-head wood screws, overall length, ¾ in.
One screw-eye, about 1 in. long.
A 60-watt blue (daylight) bulb.
Small, bakelite pull-chain switch (pigtail type).
Length of rubber-covered drop-cord ("pull-apart" type).

Above: Fastening flange to the wooden disc. Below: Soldering the metal "reflector" disc to the bottom of the brass-shell electrical socket (with switch removed).

The cardboard tube, which should be about 22 in. long, with a 3½-in. to 4-in. inside diameter, is painted inside with flat black paint to kill undesired reflections. The tube will then throw a fairly sharp spot of light. The outside of the tube is also painted flat black, and when dry, is given a coat of shellac or varnish to make it moisture-proof.



Essential parts of the device, both assembled and disassembled are shown here. The diagram gives most of the necessary construction details. Illustration to the right is a view of the completed inspection "spot" with the tube removed.

From a piece of ¾-in. hardwood stock, jigsaw a disc that will fit snugly into one end of the tube. Bore a ⅜-in. diameter hole through the exact center of this wooden disc. The disc can be stained and varnished to moisture-proof it.

Obtain the wall-flange part of a supply-pipe or flush-pipe bracket. This is a standard piece of sanitary plumbing equipment and can be obtained from a plumber or plumbing supply house. (The writer bought his for 20 cents.) This flange comes threaded for a ⅜-in. bracket, making it necessary to enlarge the opening a trifle with a rat tail file, so that a standard ⅛-in. pipe will pass through the flange snugly. Now bore a 3/16-in. hole in the nipple of the flange and thread this hole with a ¼-in. by 20 USS tap; this is for the ¼-in. thumb-screw.

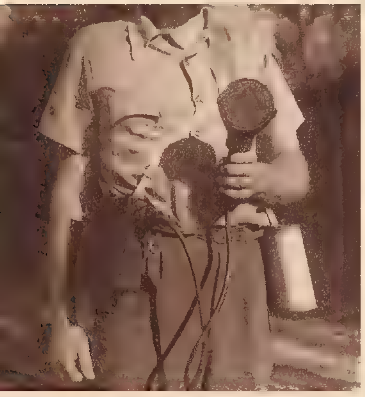
Now fasten the flange and the wooden disc together with three, round-head wood screws about ¾-in. long. Be sure that the holes are in line before fastening them together.

Thread one end of a 17-in. length of standard, ⅛-in. pipe with a ⅛-in., 27 NPT die. This thread fits the threaded nipple on the cap of an ordinary, brass-shell lamp socket. Screw the cap of the socket onto the pipe and tighten the set-screw.

The metal disc which is mounted onto the socket not only acts as a reflector, but also keeps the bulb centered within the cardboard tube. This disc, which is cut from 22-gauge sheet metal, should be ⅛-in. smaller in diameter than the inside diameter of the cardboard tube. An opening, which is equal to the outside diameter of the socket, is cut out of the

[*Continued on page* 144]

Below: Portable battery, transformer and mercury-vapor lamp make up this light, powerful torch for night prospecting. Right: Daylight viewing box utilizing filter glass over window in top of carton. Specimens are examined by the sun's ultraviolet.



Discover beautiful fluorescent minerals at night with a homemade black light outfit!

Prospecting With Black Light

by Sterling Gleason

This bearded and tattooed western desert prospector examines a find under the almost invisible beam of a black light torch made from a 5-cell flashlight and a disk of filter glass.

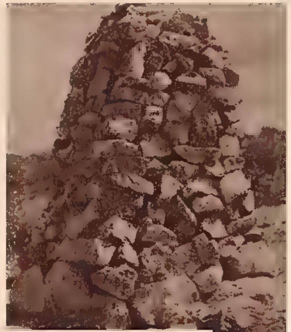
FLASH your ultraviolet torch on a pile of rocks and see minerals gleam as if outlined in fire!

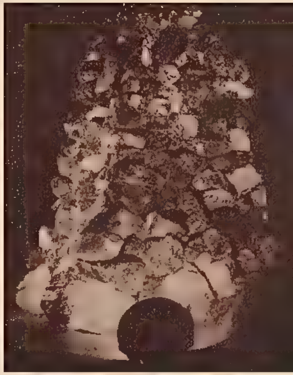
Night prospecting is as simple as that. Any of the 300-odd "fluorescent" minerals—including some commercial ores such as tungsten and zinc—can be detected by their brilliant glow under the dim purple ray from a mercury lamp. Many of them will respond to the weaker light from a simple homemade outfit costing as little as two dollars.

Luckily for the amateur prospector, these minerals are scattered widely throughout the United States. Every rock pile, every gravel bank or quarry, is a prospecting ground. A collection of these strange minerals, mounted in a dark cabinet and lighted by the dim glow of an ultraviolet torch, makes a spectacular exhibit. Visitors gasp when the dull, drab rocks suddenly flame many colors, intense and beautiful, as if from fires within. Some of these minerals also are phosphorescent. They can be "charged" with light by holding the torch close to

[*Continued on page* 116]

Right: Day and night views of claim monument at a tungsten mine in California. Night view was made by the glow of the tungsten ore under an ultraviolet lamp.





Rock specimens may be viewed in daylight by putting them into a drawer in this cabinet, shoving it under ultraviolet torch which plugs into the top, and looking down through the peephole. Such equipment is very useful in field work either by day or by night.

Build This Convertible All-Purpose Trailer

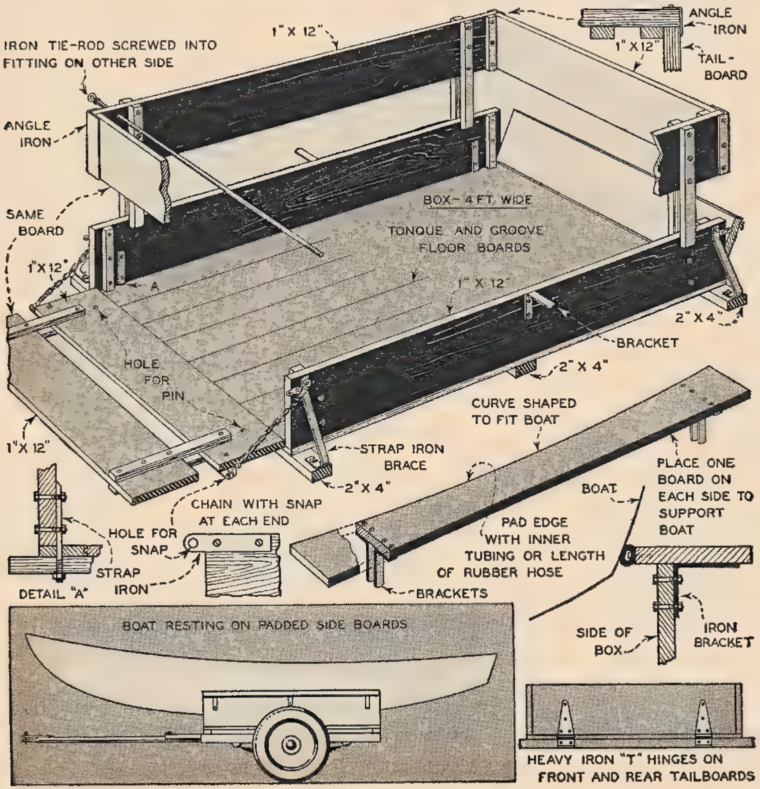
by W. Warren Anderson

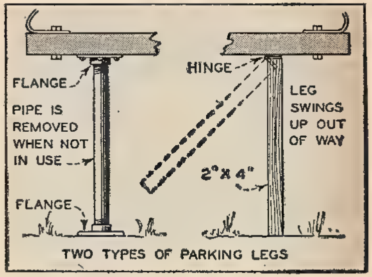
THIS trailer may be built on the installment plan, additions and features being added as needed, and as time is found to build them. Many uses will be found for this convertible trailer.

As the original trailer often carries a ton or more, and is used continually, the chassis is all-steel. The axle and chassis frame are from a wrecked Chevrolet (front axle). A wrecking yard furnished everything except the ball hitch for $15.00. A strong 2-inch galvanized pipe is used for the extensible tongue. The auto frame is bent to a V at the front and fastened together at the tip of the V with two heavy steel plates, one above and one below—to leave room for the pipe tongue to slide through. One bolt through the tongue and the two plates is removed when adjusting the tongue to short or long position. The back end of the tongue is hammered flat and drilled for another strong bolt which goes through the angle-irons which serve as cross-members for the auto-frame at the rear and at the front where the V-bend begins. Another cross-member in the middle may also be drilled to afford a third, or medium position for the tongue. Corresponding bolt holes should be drilled in the tongue to take the bolt through the plates at the V in front. A simple bolt hitch may be made as shown in the sketch, although a ball and socket hitch of good strength is preferable. A removable bumper hitch, as sketched, may be used for renting the trailer, although the trailer-owner's tow-car would be better equipped with a patented bar hitch which pulls from the rear spring-points and merely steadies itself from the car bumper. Worn bushings in the chassis may be replaced and new grease-fittings added. Brakes are not retained, although they must be used unless the trailer is kept light enough to avoid the requirement of the state law for brakes. Wood 2"x4" timbers could be used in place of the steel chassis but they are not as strong.

The basic box of this trailer should be strongly built to withstand its many uses. Cross-pieces (2"x4") of oak or very hard yellow pine are best. The 1"x12" sideboards and end gates are of hard straight-grain yellow pine. The flooring is 1"x4" tongue and groove clear fir. Six heavy wagon-box body-irons and ready-made corner latches may be purchased from a hardware dealer. Four outside corner-braces of ⅛"x1" strap iron must be made by a blacksmith. The top edge of the lower box is faced with 1/16"x¾" bevel edged strap iron put on with flat-head

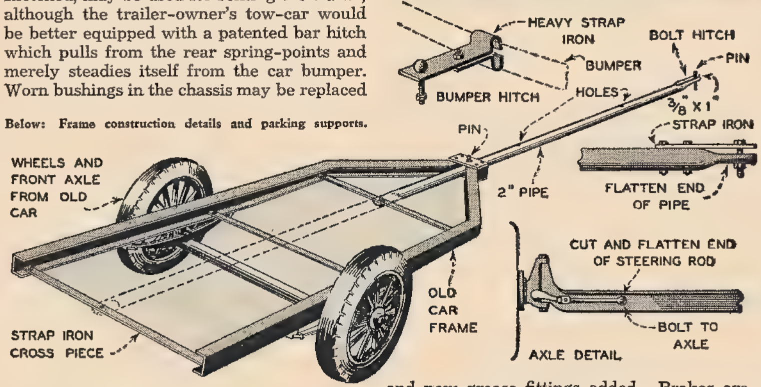
The drawings below show the "box" construction for hauling, and the adaptation for carrying boats. Note brackets.

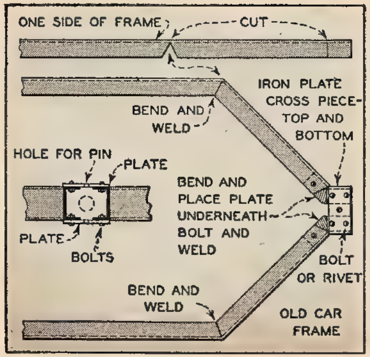

IRON TIE-ROD SCREWED INTO FITTING ON OTHER SIDE
1" X 12"
ANGLE IRON
1" X 12"
TAIL-BOARD
ANGLE IRON
SAME BOARD
1"X12"
A
BOX-4 FT. WIDE
TONGUE AND GROOVE FLOOR BOARDS
1" X 12"
2" X 4"
BRACKET
2" X 4"
HOLE FOR PIN
1"X 12"
CURVE SHAPED TO FIT BOAT
STRAP IRON BRACE
2" X 4"
BOAT
PLACE ONE BOARD ON EACH SIDE TO SUPPORT BOAT
CHAIN WITH SNAP AT EACH END
HOLE FOR SNAP
STRAP IRON
DETAIL "A"
PAD EDGE WITH INNER TUBING OR LENGTH OF RUBBER HOSE
BRACKETS
SIDE OF BOX
IRON BRACKET
BOAT RESTING ON PADDED SIDE BOARDS
HEAVY IRON "T" HINGES ON FRONT AND REAR TAILBOARDS


FLANGE
PIPE IS REMOVED WHEN NOT IN USE
FLANGE
HINGE
LEG SWINGS UP OUT OF WAY
2"x 4"

TWO TYPES OF PARKING LEGS

Below: Frame construction details and parking supports.


HEAVY STRAP IRON
BOLT HITCH
PIN
BUMPER
BUMPER HITCH
HOLES
3/8" X 1" STRAP IRON
PIN
WHEELS AND FRONT AXLE FROM OLD CAR
2" PIPE
FLATTEN END OF PIPE
CUT AND FLATTEN END OF STEERING ROD
OLD CAR FRAME
BOLT TO AXLE
AXLE DETAIL
STRAP IRON CROSS PIECE


ONE SIDE OF FRAME
CUT
IRON PLATE CROSS PIECE-TOP AND BOTTOM
BEND AND WELD
HOLE FOR PIN
PLATE
BEND AND PLACE PLATE UNDERNEATH-BOLT AND WELD
PLATE
BOLTS
BOLT OR RIVET
BEND AND WELD
OLD CAR FRAME

The Vultee Vanguard—Flying Model

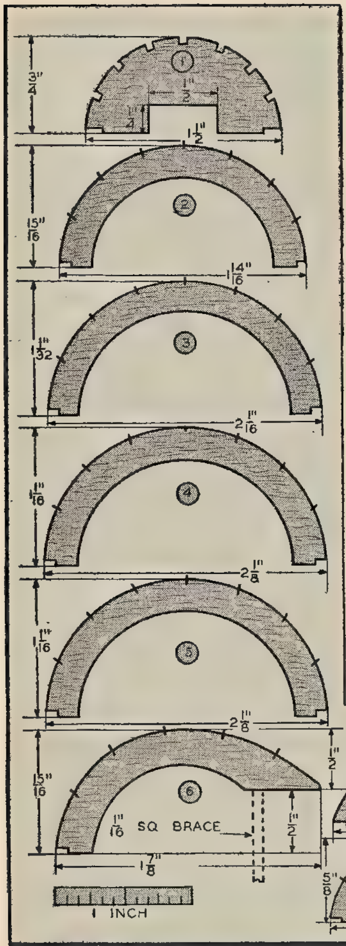
Photograph on page 95.

by Ralph Baker, Jr.

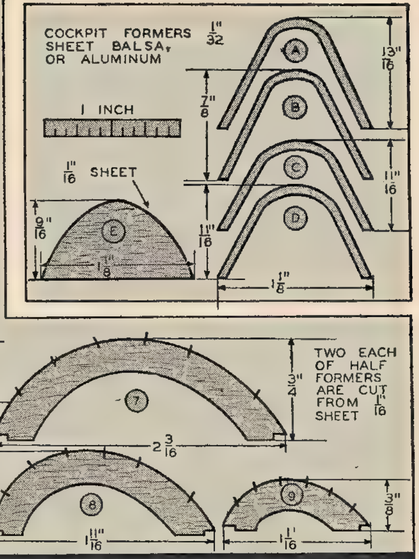
NEW fighting planes that come out these days rarely have a speed of less than 300 miles per hour. The demand is for speed, and more speed. It is usually necessary for these planes to gain altitude in a very short time. In answer to this ever increasing demand for speed combined with maneuverability, the Vultee Company has built the Vanguard.

Powered by an 1100 horsepower Pratt and Whitney Twin Wasp engine this plane rockets skyward at the rate of 6,000 feet per minute. It has a top speed well over 350 miles per hour. It is no piker in armaments, either. In all, it can mount ten or twelve guns; these firing through the propeller, from the wings, and from the tail.

The model is very good looking and is an excellent flier for its type. The construction is not difficult, even though it retains many features of its prototype. Be sure to look the plans over carefully before starting construction.



3/4"
1/2"
1/4"
1 1/2"
1
15/16"
2
1 14/16"
1 1/32"
3
2 1/16"
1 1/16"
4
2 1/8"
1 1/16"
5
2 1/8"
15/16"
1/2"
6
1/16" SQ BRACE
1/2"
1 7/8"
1 INCH



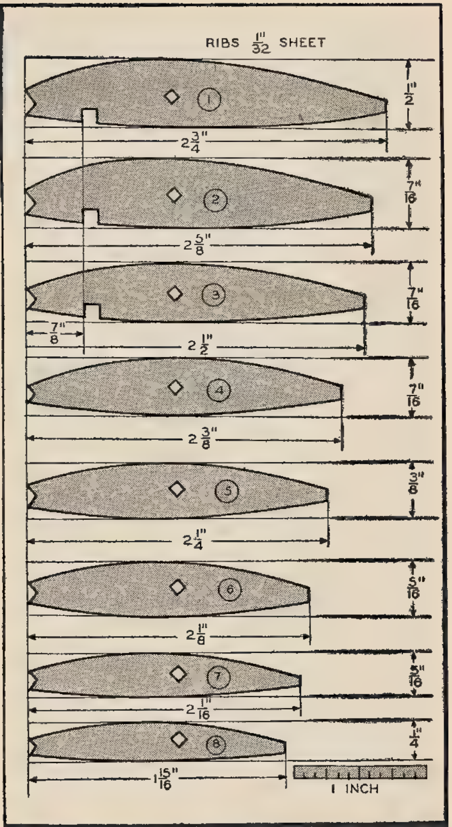
COCKPIT FORMERS 1/32" SHEET BALSA, OR ALUMINUM
1 INCH
1/16" SHEET
13/16"
7/8"
11/16"
9/16"
11/16"
1 7/8"
1 1/8"
A
B
C
D
E
TWO EACH OF HALF FORMERS ARE CUT FROM 1/16" SHEET
1/2"
3/4"
7
2 3/16"
5/8"
8
1 11/16"
3/8"
9
1 1/16"

The above bulkhead and cockpit former diagrams are full size. Trace on balsa with carbon paper.

Fuselage

To construct the fuselage, trace the shapes of the bulkheads (which are shown full size) with the aid of carbon paper. Cut them from $\frac{1}{16}$'' sheet. Only half of each bulkhead is shown on the plan. Cut two of each type. Next lay out side plan according to dimensions. Pin the keels over the plan and cement half of the bulkheads in position. After the cement has dried remove frame from the plan and add the other half of the bulkheads to the frame.

Now cement the $\frac{1}{16}$'' square stringers over the bulkheads. The fuselage can be kept from getting out of line by adding the opposite stringer each time one is cemented on. Cement the spinner block to the No. 1 bulkhead with several tiny drops of cement so that it can be shaped more easily and then removed. Sandpaper the whole fuselage framework smooth. Do not cover the fuselage at this time.



RIBS 1/32" SHEET
1
1/2"
2 3/4"
2
7/16"
2 5/8"
3
7/16"
7/8"
2 1/2"
4
7/16"
2 3/8"
5
3/8"
2 1/4"
6
5/16"
2 1/8"
7
5/16"
2 1/16"
8
1/4"
1 15/16"
1 INCH

The rib plans above are actual size. Model can be built twice size shown, if desired, by doubling all dimensions.

Wing

Make the two wing panels on a full sized sketch of the plan. The ribs are shown full size. Make a plan of the other half of the wing by tracing it on semi-transparent paper, then turning the tracing over. Cut the ribs from $\frac{1}{32}$'' sheet balsa of medium weight, and sandpaper them. The leading and trailing edges and the spar should be of hard balsa. Sandpaper the wings when glue is dry.

Tail Surfaces

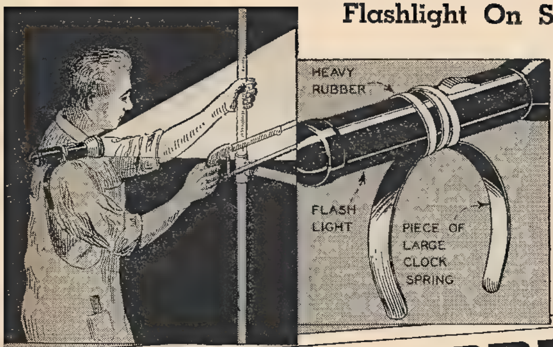
The tail surfaces have been enlarged for the model for more efficient flying. The stabilizer is built in two pieces and cemented on each side of the fuselage after covering.

Propeller

A three bladed propeller is used as on the real plane. Carve three blades from balsa

FOR ENTERPRISING SHOP HOBBYISTS

Flashlight On Shoulder Clamp

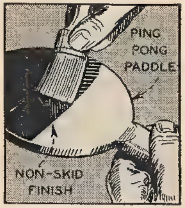

HEAVY RUBBER
FLASH LIGHT
PIECE OF LARGE CLOCK SPRING

When doing any type of work in the dark that requires both hands, this easily made shoulder clamp will hold your flashlight so as to shine on the work. A section of a large clock spring is cut as shown. Ends must be ground round so they won't tear.

Nail Through Screwdriver Makes Working Easier

When driving screws in hard wood, a hole bored through the handle of the screwdriver as shown, will be a great help. A large nail can be inserted through the hole to act as a lever, when desired.—*A. V.*

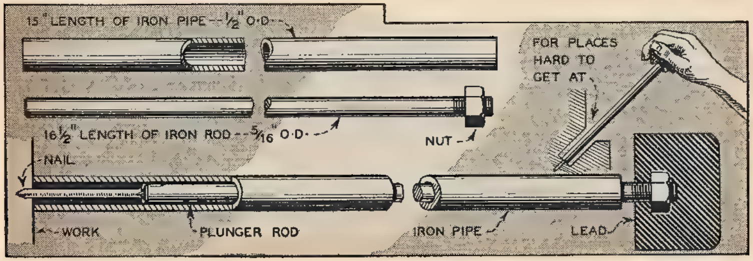
Non-Skid Wood Finish


PING PONG PADDLE
NON-SKID FINISH

A teaspoonful of powdered pumice stone mixed with two ounces of white or orange shellac or varnish, makes an inexpensive and easily applied non-skid finish for table tennis paddles, etc.

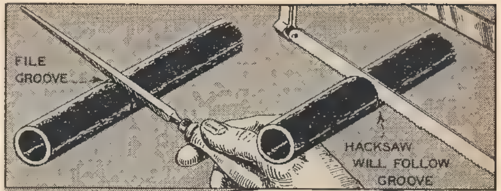
"Tight Spot" Nail Driver

Nails can easily be driven into surfaces ordinarily difficult to reach when this simple tool is used. Made from a $\frac{5}{16}$" iron rod and a length of ½" O.D. iron pipe, it will be a great aid to the woodworker.—*A. T.*


15" LENGTH OF IRON PIPE--½" O.D.
FOR PLACES HARD TO GET AT
16½" LENGTH OF IRON ROD--5/16" O.D.
NUT
NAIL
WORK
PLUNGER ROD
IRON PIPE
LEAD

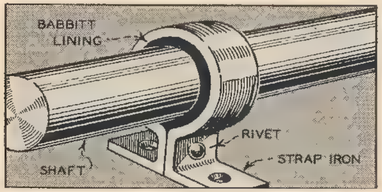
Making Square Hacksaw Cuts On Pipe

It is often desirable to cut off a piece of pipe with a hacksaw in such a way as to be certain the cut will be squared. One method of assuring a square cut consists of first filing a shallow groove around the pipe with a 3-cornered file. The saw will follow the groove.

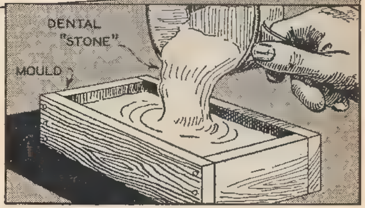

FILE GROOVE
HACKSAW WILL FOLLOW GROOVE

Simple Shaft Bearings

Line shaft bearings for machine tools can be made of strap iron $\frac{3}{16}$" thick and about 1" wide. Bend iron first, then pour the babbitt. Drill oil hole in top.—*H. J.*


BABBITT LINING
RIVET
STRAP IRON
SHAFT

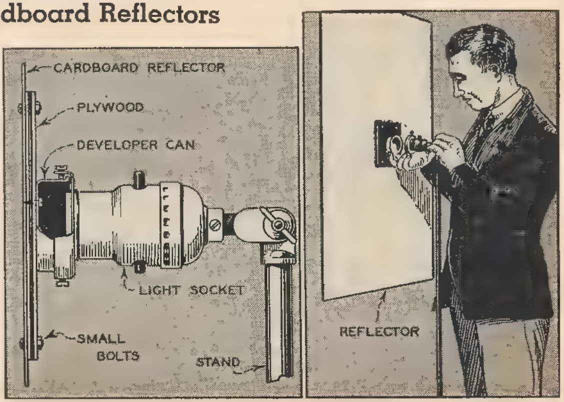
Dental Stone For Moulds

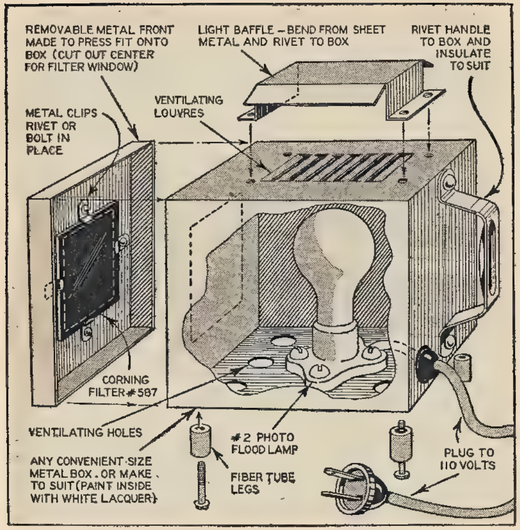

DENTAL "STONE"
MOULD

Some of the uses to which amateur mechanics put plaster of Paris will be much better filled by dental "stone." This is a compound used by dentists. It costs about 15c a pound, is very strong and may be used for foundry patterns.—*C. B.*

Holder For Cardboard Reflectors

Cardboard reflectors can be adapted for mounting on bridge lamps and portable photolight stands by making use of the top container of a two quart developer can. Readily snapped into the shade bracket, into which it fits perfectly, the adapter can be locked in place by tightening the bracket set screws. A small plywood panel supports the cardboard.—*J. M.*


CARDBOARD REFLECTOR
PLYWOOD
DEVELOPER CAN
LIGHT SOCKET
SMALL BOLTS
STAND
REFLECTOR


REMOVABLE METAL FRONT MADE TO PRESS FIT ONTO BOX (CUT OUT CENTER FOR FILTER WINDOW)
LIGHT BAFFLE – BEND FROM SHEET METAL AND RIVET TO BOX
RIVET HANDLE TO BOX AND INSULATE TO SUIT
METAL CLIPS RIVET OR BOLT IN PLACE
VENTILATING LOUVRES
CORNING FILTER #587
VENTILATING HOLES
#2 PHOTO FLOOD LAMP
PLUG TO 110 VOLTS
ANY CONVENIENT SIZE METAL BOX, OR MAKE TO SUIT (PAINT INSIDE WITH WHITE LACQUER)
FIBER TUBE LEGS

An AC-DC lamp for use in home or laboratory. Oil can will make a suitable box.

Prospecting With Black Light

[*Continued on page* 97]

them for a few seconds. Uncannily, they spit flame for seconds or perhaps minutes after the torch has passed on. Recently an amateur prospector found a piece of willemite that glowed so brilliantly he could read a newspaper by its light. It kept right on glowing for nearly two hours!

War needs are booming black light prospecting for scheelite, ore of tungsten, which looks just like common rock among which it is found, but under the torch glows a brilliant blue. Miners use mercury-vapor lamps to follow the vein, to sort ore from worthless rock, and to test waste on the dump to be sure all the tungsten has been removed. One mill found unsuspected ore only a quarter of a mile away. On test it proved far richer than where they had been working three years! A prospector crawled down into six "gopher holes" where an earlier miner in search of lead had burrowed. A blue gleam under the torch revealed all of them heavy with tungsten ore.

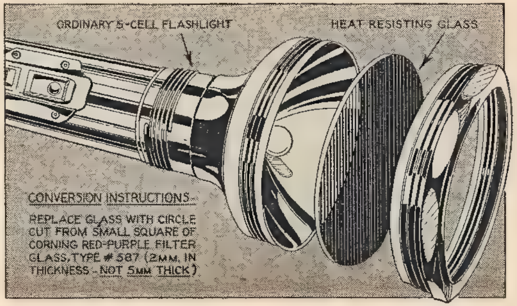
Recently an amateur prospector noticed a yellow mineral cast aside by miners as valueless, but which glowed strangely under his ultraviolet lamp. Assay revealed a large percentage of uranium —mother ore of radium!

Simplest and cheapest homemade lamp for night prospecting is an ordinary five-cell flashlight whose lens has been replaced with a Corning filter of the red-purple Type No. 587. A ⅜″ square (stock size) from which the required circle can be cut, costs $1.50. This torch will cause many fluorescent minerals to glow if held within an inch or so of the lamp.

For a stronger torch, mount an ordinary photoflood bulb in a metal box with plenty of ventilation to dissipate heat. Cut a window in the front and mount a Heat-Resisting Type 587 filter over it. Be sure the ventilating holes don't leak light, blanking out the glow of the rocks.

Still more ultraviolet, and correspondingly better effects, can be had with a 25-watt light "black light bulb." Like the photoflood, this runs on 110 volts, t.c. or d.c., and needs no filter, but does not need to be enclosed. Never operate this type of bulb more than five to ten minutes at a time, as they get very hot and may swell up dangerously—and *don't* mount them close to anything that will burn.

For field prospecting, however, the photoflood and black bulb are out of the question because portable current supply is impractical. Fortunately, the General Electric Company now is making a small argon-filled glow bulb which has no filament and lends itself well to portable units. It fits a standard lamp socket and operates from 90 volts or more of radio "B" battery, or from a small spark coil such as that from a Model "T" Ford. Best of all, it sells for only fifty cents. A bank of four, placed close together with a reflector behind, makes a convenient outfit which needs no filter because little visible light is produced. The Ford coil can be operated from a six-volt "Hot-Shot" battery, or four standard dry cells taped together and slung on shoulder straps. Adjust the vibrator so the coil gives the fattest spark, as determined by a short spark gap between two wires attached to the secondary terminals. Be sure of all wires leading from the secondary of the coil to the glow lamps are well insulated, as the high-voltage can give you a nasty bite.


ORDINARY 5-CELL FLASHLIGHT
HEAT RESISTING GLASS
CONVERSION INSTRUCTIONS–
REPLACE GLASS WITH CIRCLE CUT FROM SMALL SQUARE OF CORNING RED-PURPLE FILTER GLASS, TYPE #587 (2MM. IN THICKNESS – NOT 5MM THICK)

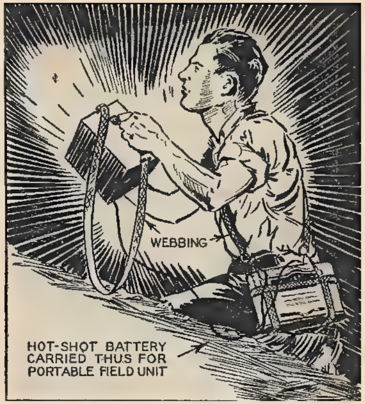
Right: The flashlight ultraviolet torch. Filter comes 3⅛″ square, standard size, which is just right to obtain the correct sized circle.

One ingenious prospector operates his lamp by wires attached to the high-voltage leads on his automobile distributor head. Plenty of insulation is necessary.

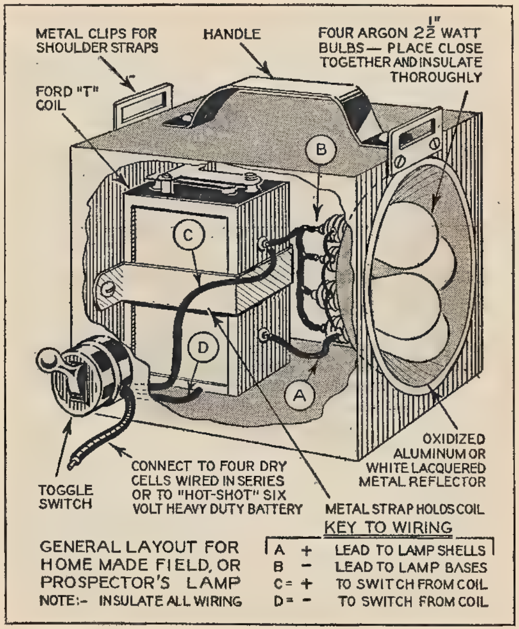
The argon glow bulb works equally well on ordinary 11-volt house current, d.c. or a.c. It is handy also for exhibiting your collection of fluorescent minerals. A bright reflector will help in directing the rays where desired. The shinest looking material is not necessarily the best mirror for the very short ultraviolet rays. Aluminum is an excellent material, and strangely, oxidized aluminum reflects more ultraviolet than the polished kind. Ordinary aluminum paint, however, is not bright, and unless your paint is a very bright sprayed aluminum, a pure white lacquer is better.

If you'd rather do your night prospecting by daylight, you can utilize the sun's ultraviolet. Fit a light cardboard box with a black cloth big enough to drape around your shoulders and keep out the light, except what is allowed to come through a No. 587 filter glass fastened over a hole in the top. Fasten the flaps of the open side so you can put specimens inside and look at them under the filtered sunlight. This "solariscope" viewing box will not work with scheelite or certain other ores requiring very short rays, as the earth's at-

[*Continued on page* 156]

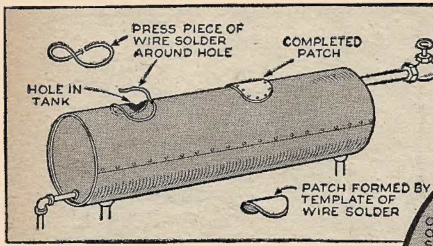

WEBBING
HOT-SHOT BATTERY CARRIED THUS FOR PORTABLE FIELD UNIT

A cluster of four argon bulbs form the black light element of this easily made portable lamp. Oxidized aluminum makes the best reflector for ultraviolet light—polished or bright materials are not as good. Dimensions are not given as box can be made to suit.


METAL CLIPS FOR SHOULDER STRAPS
HANDLE
FOUR ARGON 2½ WATT BULBS — PLACE CLOSE TOGETHER AND INSULATE THOROUGHLY
FORD "T" COIL
B
C
D
A
OXIDIZED ALUMINUM OR WHITE LACQUERED METAL REFLECTOR
TOGGLE SWITCH
CONNECT TO FOUR DRY CELLS WIRED IN SERIES OR TO "HOT-SHOT" SIX VOLT HEAVY DUTY BATTERY
METAL STRAP HOLDS COIL
GENERAL LAYOUT FOR HOME MADE FIELD, OR PROSPECTOR'S LAMP
NOTE:- INSULATE ALL WIRING
KEY TO WIRING
A + LEAD TO LAMP SHELLS
B − LEAD TO LAMP BASES
C= + TO SWITCH FROM COIL
D= − TO SWITCH FROM COIL

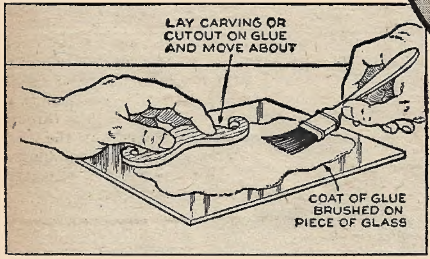
Improve Your Shop Technique

by A. H. Waychoff


PRESS PIECE OF WIRE SOLDER AROUND HOLE
COMPLETED PATCH
HOLE IN TANK
PATCH FORMED BY TEMPLATE OF WIRE SOLDER

Airtight Glue Can Cover →

QUICK drying cement evaporates rapidly if the cover is loose. Half of a rubber ball makes a handy airtight safety cover.


LAY CARVING OR CUTOUT ON GLUE AND MOVE ABOUT
COAT OF GLUE BRUSHED ON PIECE OF GLASS

Cleaning Paint Brushes →

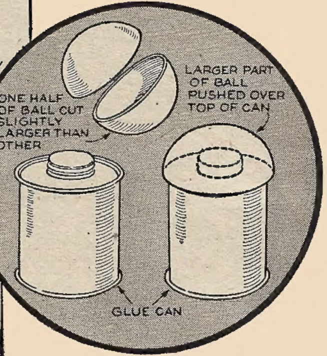
THIS arrangement solves the brush cleaning problem very well. An ordinary metal comb is fitted into slots hacksawed in the sides of the cleaning pan. After the brush has been soaked thoroughly in the solution, draw it through the comb for complete cleaning.

Preserving Color Of Chestnut

TO PRESERVE the natural color of chestnut paneling, use a protective coating of white wax or white shellac. A very thin coat of shellac followed, when dry, by a finishing coat of white wax, is recommended. Polish until the finish is as high as you desire. If you prefer a dull coat, use two thin coats of shellac, sandpapered down between coats.

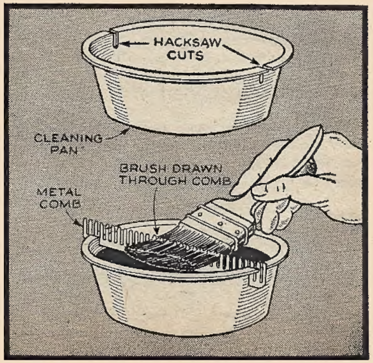
← Template Of Solder

WHEN making patches or other articles to fit irregular shapes, the ordinary type of wire solder makes good templates.


ONE HALF OF BALL CUT SLIGHTLY LARGER THAN OTHER
LARGER PART OF BALL PUSHED OVER TOP OF CAN
GLUE CAN

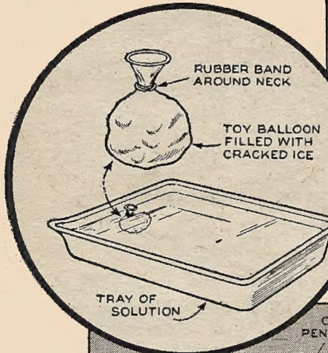
← Gluing Carvings

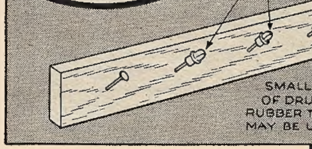
WHEN scroll saw cut outs are to be glued to flat surfaces the glue often runs over the edges. If the glue is spread on glass and the work pressed down on it, surfaces coated will not run over.


HACKSAW CUTS
CLEANING PAN
BRUSH DRAWN THROUGH COMB
METAL COMB

Making Staples →

IF A particular size staple is required and none are available, this simple method will often save the day. A piece of strap iron of the proper size is wound with medium stiff iron wire as shown. A sharp cold chisel is then used as indicated to sever the windings along the center line. They must be cut on both sides, of course, and then separated for use.


RUBBER BAND AROUND NECK
TOY BALLOON FILLED WITH CRACKED ICE
TRAY OF SOLUTION

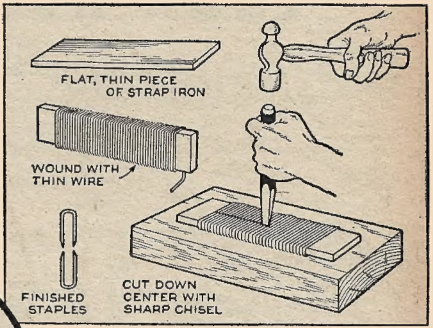

CAP-TYPE PENCIL ERASERS
SMALL PIECE OF DRUGGIST'S RUBBER TUBING MAY BE USED

Eraser-Nail Coat Hooks ↑

SLIP-ON type pencil erasers will prevent nails from tearing clothes that are hung on them. The erasers are simply pressed over the heads of the nails as shown.

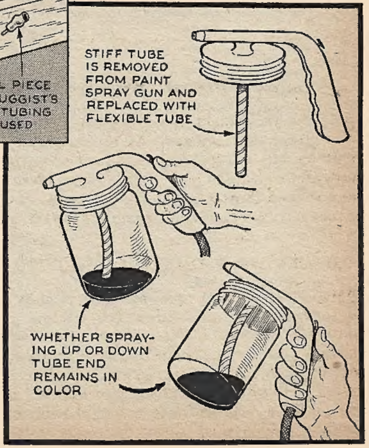
Paint Spray Improvement →

A LOW level in the paint supply jar of a spray gun often causes interruptions in the spray. A flexible rubber tube, weighted to swing to the lowest point in the jar, will use all the paint. A rigid tube won't.

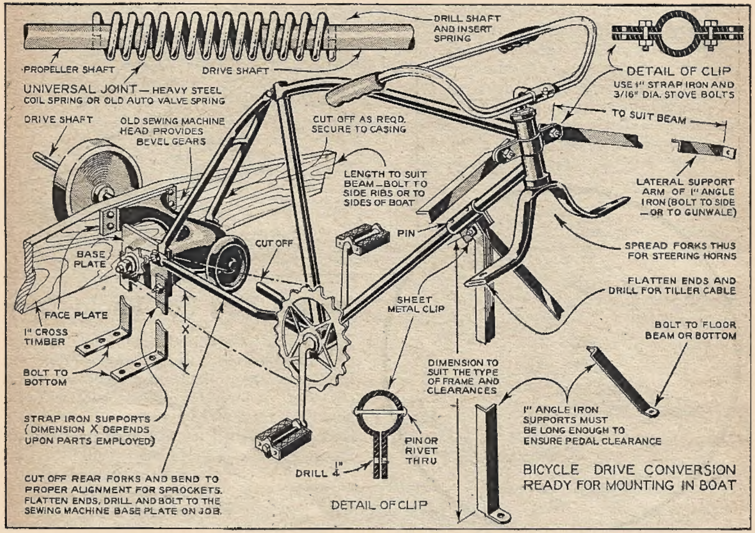

FLAT, THIN PIECE OF STRAP IRON
WOUND WITH THIN WIRE
FINISHED STAPLES
CUT DOWN CENTER WITH SHARP CHISEL

← Ice Bag For Photo Trays

WHENEVER it is desirable to maintain a fixed temperature in any solution that has a tendency to heat up, this device will be effective. A large toy balloon such as can be bought in the 5 and 10 cent store is used as an ice bag. Crushed ice is placed in it through the neck. The thin rubber permits the ice to cool the solution without diluting it. This is especially important in photographic work.


STIFF TUBE IS REMOVED FROM PAINT SPRAY GUN AND REPLACED WITH FLEXIBLE TUBE
WHETHER SPRAYING UP OR DOWN TUBE END REMAINS IN COLOR

A BICYCLE DRIVE FOR YOUR ROWBOAT


DRILL SHAFT AND INSERT SPRING
PROPELLER SHAFT
DRIVE SHAFT
UNIVERSAL JOINT—HEAVY STEEL COIL SPRING OR OLD AUTO VALVE SPRING
DETAIL OF CLIP
USE 1" STRAP IRON AND 3/16" DIA. STOVE BOLTS
DRIVE SHAFT
OLD SEWING MACHINE HEAD PROVIDES BEVEL GEARS
CUT OFF AS REQD. SECURE TO CASING
TO SUIT BEAM
LENGTH TO SUIT BEAM—BOLT TO SIDE RIBS OR TO SIDES OF BOAT
LATERAL SUPPORT ARM OF 1" ANGLE IRON (BOLT TO SIDE —OR TO GUNWALE)
PIN
SPREAD FORKS THUS FOR STEERING HORNS
BASE PLATE
CUT OFF
FLATTEN ENDS AND DRILL FOR TILLER CABLE
FACE PLATE
SHEET METAL CLIP
BOLT TO FLOOR BEAM OR BOTTOM
1" CROSS TIMBER
X
BOLT TO BOTTOM
DIMENSION TO SUIT THE TYPE OF FRAME AND CLEARANCES
1" ANGLE IRON SUPPORTS MUST BE LONG ENOUGH TO ENSURE PEDAL CLEARANCE
STRAP IRON SUPPORTS (DIMENSION X DEPENDS UPON PARTS EMPLOYED)
PIN OR RIVET THRU
DRILL 1/4"
BICYCLE DRIVE CONVERSION READY FOR MOUNTING IN BOAT
CUT OFF REAR FORKS AND BEND TO PROPER ALIGNMENT FOR SPROCKETS. FLATTEN ENDS, DRILL AND BOLT TO THE SEWING MACHINE BASE PLATE ON JOB.
DETAIL OF CLIP

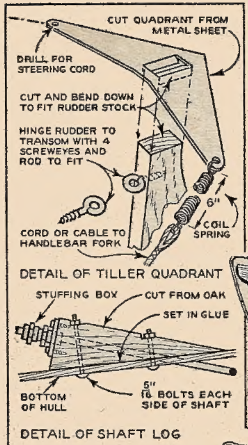
The drawing above shows the construction details of the driving mechanism for the pedal-powered boat. Note universal joint.

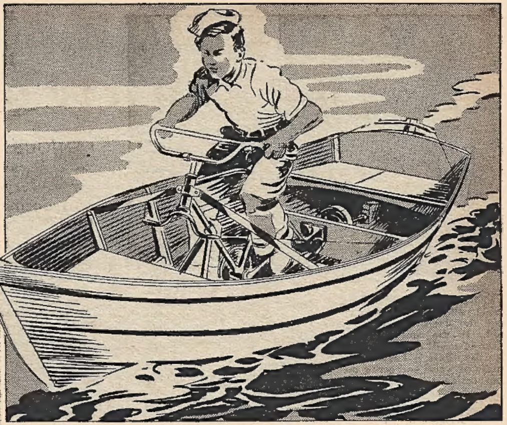
AN OLD bicycle, the head from a discarded sewing machine and a few odds and ends of metal will suffice to enable the home boat builder to rig up a bicycle drive for the rowboat. Many details of the construction and assembly will have to be arranged to suit the size and design of the boat and the bicycle. But, using the design and arrangements shown in the sketches as a basis, a driving unit can be put together that will propel your rowboat along at reasonable speed with no more exertion than pedaling a bicycle down Main street. The cost is little, the fuel absolutely free, and the results as good as a small outboard motor. So let's get going.

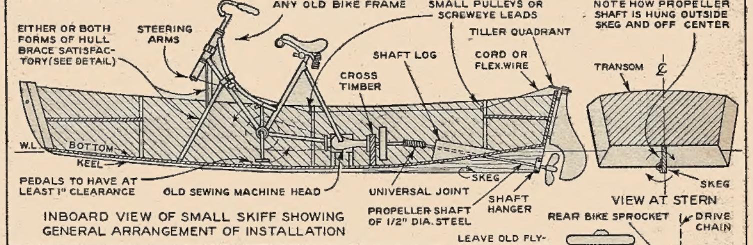
This design is suited to a boat of from ten to twelve feet in length. The lighter the construction the better. First erect the bicycle frame and line up the remainder of the assembly from that.

Strip a bicycle of its wheels, rear hub and all accessories. Sit in the boat so you will be at a point to keep the boat in trim, fore and aft and from gunwale to gunwale. Saw off the front fork about 6-in. below the spreader and spread out the tines horizontally to form the steering-bar. Then fashion a support of angle-iron to clamp solidly about the steering-head and reach across the width of the hull and bolt through each gunwale. Note that the bicycle frame must be supported high enough to allow the pedals to clear the bottom of the boat by at least 1-in. when at their lower point. Do not bolt frame down until drive shaft has been lined up. Bike will set slightly off center because of width of sewing machine head.

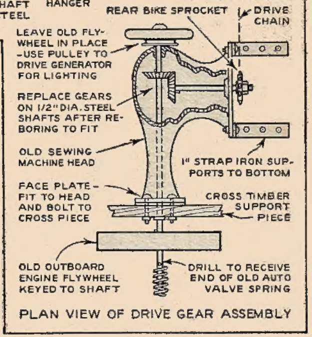
Strip the sewing machine head of all its parts and remove the bevel gears. Drill out and rearrange these on ½-in. steel shafting so they will mesh in the position shown. This will allow the rear bicycle sprocket to be keyed onto the end of the vertical gear shaft and project outside the rear bicycle fork which later can be attached to the sewing machine head base. Sprocket outside makes it necessary to re-align chain drive to pedal sprocket. The other fork will have to be bolted to the machine head by drilling and tapping the latter. This arrangement places the sewing machine head on its side and the working end, which should have a face plate fitted and bolted to it (with bearing) bolts solidly to a cross timber bolted across the boat. The horizontal shaft should be sufficiently long to reach back through a hole in this timber and carry a fly-wheel and universal joint.


CUT QUADRANT FROM METAL SHEET
DRILL FOR STEERING CORD
CUT AND BEND DOWN TO FIT RUDDER STOCK
HINGE RUDDER TO TRANSOM WITH 4 SCREWEYES AND ROD TO FIT
6"
COIL SPRING
CORD OR CABLE TO HANDLEBAR FORK
DETAIL OF TILLER QUADRANT
STUFFING BOX
CUT FROM OAK
SET IN GLUE
BOTTOM OF HULL
5/16" BOLTS EACH SIDE OF SHAFT
DETAIL OF SHAFT LOG




ANY OLD BIKE FRAME
SMALL PULLEYS OR SCREWEYE LEADS
NOTE HOW PROPELLER SHAFT IS HUNG OUTSIDE SKEG AND OFF CENTER
EITHER OR BOTH FORMS OF HULL BRACE SATISFACTORY (SEE DETAIL)
STEERING ARMS
TILLER QUADRANT
SHAFT LOG
CORD OR FLEX.WIRE
TRANSOM
℄
CROSS TIMBER
W.L.
BOTTOM
KEEL
SKEG
SKEG
PEDALS TO HAVE AT LEAST 1" CLEARANCE
OLD SEWING MACHINE HEAD
UNIVERSAL JOINT
SHAFT HANGER
VIEW AT STERN
INBOARD VIEW OF SMALL SKIFF SHOWING GENERAL ARRANGEMENT OF INSTALLATION
PROPELLER SHAFT OF 1/2" DIA. STEEL

The installation in the boat is clearly shown in sketch above.


REAR BIKE SPROCKET
DRIVE CHAIN
LEAVE OLD FLY-WHEEL IN PLACE -USE PULLEY TO DRIVE GENERATOR FOR LIGHTING
REPLACE GEARS ON 1/2" DIA. STEEL SHAFTS AFTER RE-BORING TO FIT
OLD SEWING MACHINE HEAD
1" STRAP IRON SUPPORTS TO BOTTOM
FACE PLATE - FIT TO HEAD AND BOLT TO CROSS PIECE
CROSS TIMBER SUPPORT PIECE
OLD OUTBOARD ENGINE FLYWHEEL KEYED TO SHAFT
DRILL TO RECEIVE END OF OLD AUTO VALVE SPRING
PLAN VIEW OF DRIVE GEAR ASSEMBLY

The flywheel is utilized to steady the propeller revolutions as well as provide latent power to assist the rider. Key or fasten these parts on in the usual manner. When all is completed as far as the universal joint; go over the assembly and line up as true as possible to remove distortion in the shafting and assure of good gear meshing and chain tension. Then grease and oil all moving parts.

From the universal joint, run a ½-in. shaft down through a shaft-log to

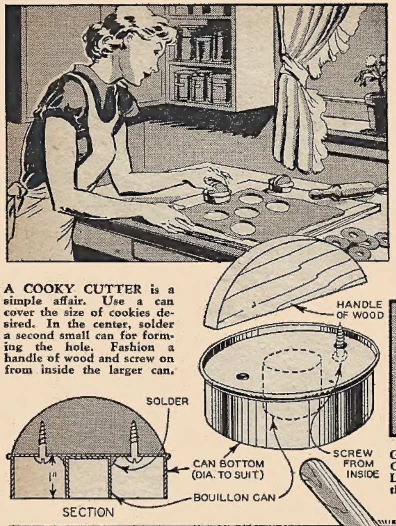
[*Continued on page* 160]

TINCAN -OLOGY

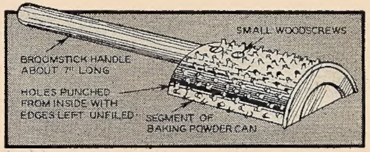
Useful gadgets from old tin cans

by L. B. Robbins

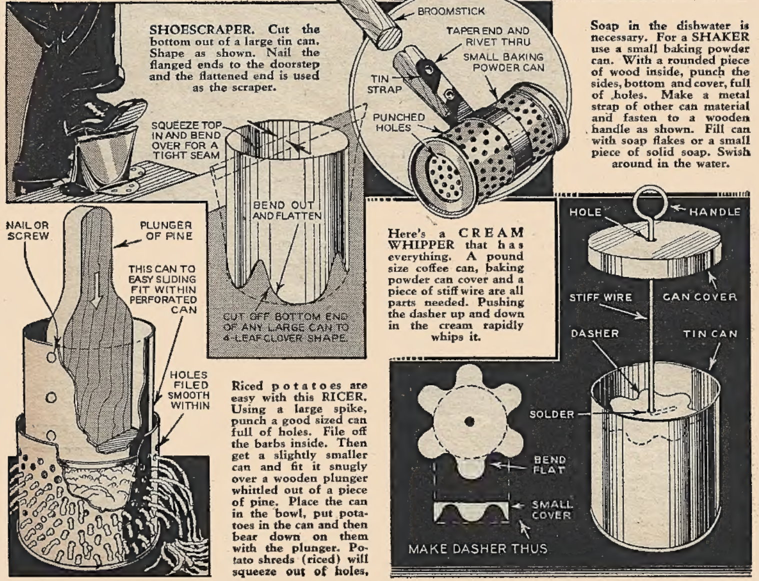
THOUSANDS upon thousands of dollars worth of tin cans are thrown away every year. Many of these cans can be redeemed and excellent use made of them about the house or in the camp. Anyone with a bit of mechanical ingenuity who is able to wield a soldering iron can do much with an empty can. The following ideas are only a few of many possible ones. Look them over. Then get busy and make a few handy gadgets for the wife, yourself or your friends. It's fun and you'll be surprised at what can be made from an otherwise useless object.


HANDLE OF WOOD
SOLDER
CAN BOTTOM (DIA. TO SUIT)
SCREW FROM INSIDE
1"
BOUILLON CAN
SECTION

A COOKY CUTTER is a simple affair. Use a can cover the size of cookies desired. In the center, solder a second small can for forming the hole. Fashion a handle of wood and screw on from inside the larger can.


SMALL WOODSCREWS
BROOMSTICK HANDLE ABOUT 7" LONG
HOLES PUNCHED FROM INSIDE WITH EDGES LEFT UNFILED
SEGMENT OF BAKING POWDER CAN

Grated cheese is a simple matter with this tin can **GRATER.** Cut a can in half lengthways, leaving half the bottom in place. Lay the can on a block of heavy wood and punch holes from the inside, using a large spike. Fasten a handle to one end.

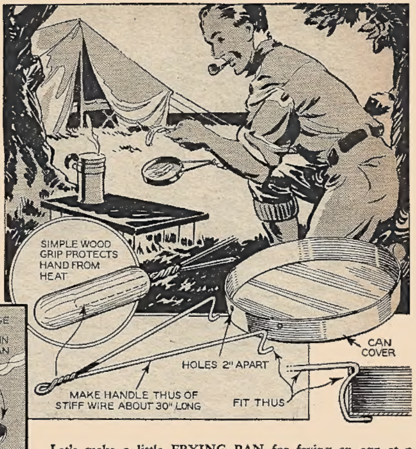

BROOMSTICK
TAPER END AND RIVET THRU
SMALL BAKING POWDER CAN
TIN STRAP
PUNCHED HOLES
SQUEEZE TOP IN AND BEND OVER FOR A TIGHT SEAM
BEND OUT AND FLATTEN
CUT OFF BOTTOM END OF ANY LARGE CAN TO 4-LEAF CLOVER SHAPE.
NAIL OR SCREW
PLUNGER OF PINE
THIS CAN TO EASY SLIDING FIT WITHIN PERFORATED CAN
HOLES FILED SMOOTH WITHIN
HOLE
HANDLE
STIFF WIRE
CAN COVER
DASHER
TIN CAN
SOLDER
BEND FLAT
SMALL COVER
MAKE DASHER THUS

SHOESCRAPER. Cut the bottom out of a large tin can. Shape as shown. Nail the flanged ends to the doorstep and the flattened end is used as the scraper.

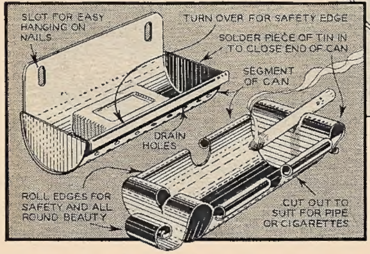
Soap in the dishwater is necessary. For a **SHAKER** use a small baking powder can. With a rounded piece of wood inside, punch the sides, bottom and cover, full of holes. Make a metal strap of other can material and fasten to a wooden handle as shown. Fill can with soap flakes or a small piece of solid soap. Swish around in the water.

Here's a **CREAM WHIPPER** that has everything. A pound size coffee can, baking powder can cover and a piece of stiff wire are all parts needed. Pushing the dasher up and down in the cream rapidly whips it.

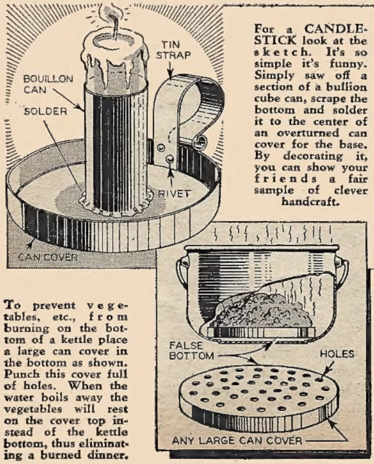
Riced potatoes are easy with this **RICER.** Using a large spike, punch a good sized can full of holes. File off the barbs inside. Then get a slightly smaller can and fit it snugly over a wooden plunger whittled out of a piece of pine. Place the can in the bowl, put potatoes in the can and then bear down on them with the plunger. Potato shreds (riced) will squeeze out of holes.


SIMPLE WOOD GRIP PROTECTS HAND FROM HEAT
CAN COVER
HOLES 2" APART
MAKE HANDLE THUS OF STIFF WIRE ABOUT 30" LONG
FIT THUS

Let's make a little **FRYING PAN** for frying an egg at a time. It is only necessary to find the cover to one of those large cracker tins. Drill two holes about 2" apart near the top edge. Then attach about 30" of galvanized telephone wire for a handle as shown. Push the ends through the holes in the pan, turn the handle over and it will grab the pan nicely from below. Insulate the handle with wood. It can be quickly taken apart and stowed in the knapsack if camping.

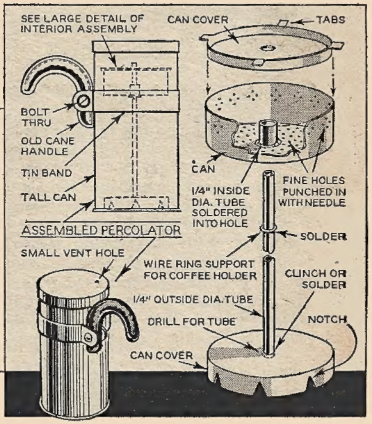

SLOT FOR EASY HANGING ON NAILS
TURN OVER FOR SAFETY EDGE
SOLDER PIECE OF TIN IN TO CLOSE END OF CAN
SEGMENT OF CAN
DRAIN HOLES
ROLL EDGES FOR SAFETY AND ALL ROUND BEAUTY
CUT OUT TO SUIT FOR PIPE OR CIGARETTES

Want a good **SOAP DISH?** Cut out a suitable tin can as shown. Punch the rounded portion full of holes with a nail and make two holes in the tab to hang it up by. In much the same manner you can make an **ASH TRAY** that will also hold cigar or pipe. Cut a can in half lengthways but leave each end intact. These are then squared off and bent over for legs. Two notches act as the cigar holder.

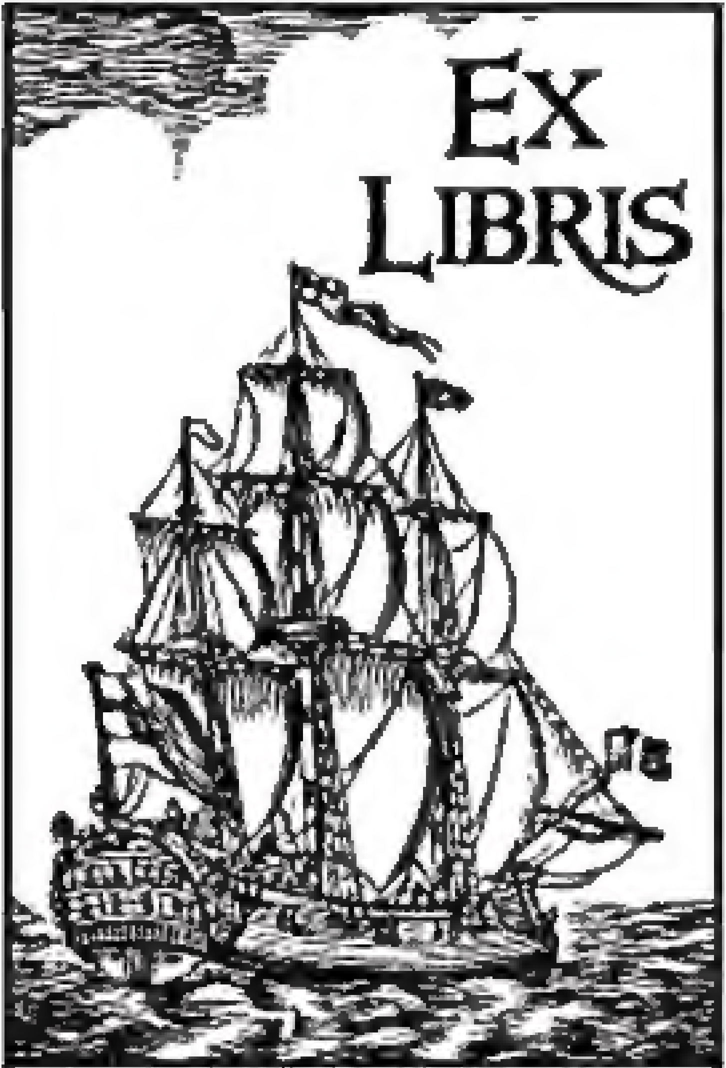

TIN STRAP
BOUILLON CAN
SOLDER
RIVET
CAN COVER
FALSE BOTTOM
HOLES
ANY LARGE CAN COVER

For a **CANDLESTICK** look at the sketch. It's so simple it's funny. Simply saw off a section of a bullion cube can, scrape the bottom and solder it to the center of an overturned can cover for the base. By decorating it, you can show your friends a fair sample of clever handcraft.

To prevent vegetables, etc., from burning on the bottom of a kettle place a large can cover in the bottom as shown. Punch this cover full of holes. When the water boils away the vegetables will rest on the cover top instead of the kettle bottom, thus eliminating a burned dinner.


SEE LARGE DETAIL OF INTERIOR ASSEMBLY
CAN COVER
TABS
BOLT THRU
OLD CANE HANDLE
TIN BAND
TALL CAN
ASSEMBLED PERCOLATOR
CAN
1/4" INSIDE DIA. TUBE SOLDERED INTO HOLE
FINE HOLES PUNCHED IN WITH NEEDLE
SOLDER
SMALL VENT HOLE
WIRE RING SUPPORT FOR COFFEE HOLDER
CLINCH OR SOLDER
1/4" OUTSIDE DIA. TUBE
DRILL FOR TUBE
NOTCH
CAN COVER

Our final and crowning project is a **COFFEE PERCOLATOR.** Use a large, tall can for the bottom. Make a wide band of tin to strap around the middle, and add a handle, as shown. The in'ards consist of a smaller can cover into which is soldered the end of a piece of ¼" metal tubing slightly shorter than the "urn." Choose a short can and cover for the ground coffee. With a needle awl punch the bottom *full* of small holes. Make a hole in the center of the cover to fit over the long tube and cut four tabs around the edge. Solder a wire ring on the tube.



Anon. Malefactor